THE BULLETIN OF THE AMATEUR ENTOMOLOGISTS' SOCIETY

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Edited by
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AES BULLETIN

No. 145

JANUARY 1953

I'm looking in to wish You a Happy New Year!

PRESIDENTIAL REFLECTIONS

The columns of our *Bulletin* remind us frequently of the need for the scientific approach to entomology. In spite of having had something of a scientific training—one-sided, it must be admitted—I am still far from clear in my mind as to what a scientific approach is. All I know is that if I am told that my attitude over a certain problem is unscientific, I am meant to feel that I am an intellectual, and probably also a moral, delinquent, a kind of cosh boy in the world of well-ordered and properly behaved scientific minds. This unfortunate and topical analogy goes further than one might think, because, like the cosh boys, I have no great sense of remorse over my delinquency. And I can quite easily go over to the offensive by suspecting that this constant emphasis on being scientific is a sort of mental priggishness, a narrowness and intolerance dressed up as detached tolerance and, what is worse, that it suffocates the imagination and creative impulses. Having had some experience of the allegedly separate and incompatible worlds—the " scientific " and the " artistic "—I can see that both have advantages and disadvantages in their unadulterated forms. Certainly, you cannot do statistics on creative impulses alone, and I suppose statistical compilations are necessary, provided they are not regarded as the ultimate goal and the final arbiter of things. I like the story about the " electronic brain " which was used to forecast the results of the recent presidential elections in America. Univac, as this contraption is called, was fed with every conceivable statistic of every presidential election for years past, and, after it had been given a fair bit of time to digest this vast quantity, it was asked for its election forecast. Univac's first returns said, quite definitely, it would be a landslide for Mr. Eisenhower. The sociologists and statisticians were alarmed at this nonsense, and declared that Univac was suffering from a bad indigestion as a result of having had too much fed to him too quickly. So they took forcibly from him great chunks of statistics that had been fed, to him; they gave him a rest and asked him again what the result of the presidential election would be. This time, Univac said very pontifically that, on the basis of the evidence supplied him, he thought it impossible to forecast accurately what the result would be, but the two contestants were so evenly matched that there was not much in it. The gathering of the experts around Univac heaved a sigh of relief that Univac had obviously got over his indigestion and was behaving rationally again. A little while after, the actual results of the election began to come in. Fresh consternation broke out again among the statisticians; it *was* a landslide for Mr. Eisenhower. Feverishly they plied Univac with all the statistics they had taken away from him. But now, of course, it was too late; the results were known; Univac had been right all along. Statistics had been all right; it was just that the statisticians had been wrong.

Not that this anecdote need be taken seriously. We always like to see the pundit in an alien technical field proved an ass, and, quite

obviously, you can make an ass of yourself whether you imagine you are behaving as a scientist should, or whether you imagine you are behaving as an artist should.

There is no logical reason why the two human components of science and non-science should not be blended, and indeed they often are, but the people who do make them mix satisfactorily are generally of exceptional ability. I myself think that a so-called strict scientific training tends to stifle initiative, enthusiasm and curiosity. By nature, the scientist, like everyone else, would like to make vast generalisations out of insufficient data (" I saw a man with ginger hair lose his temper, therefore all men with ginger hair lose their tempers, therefore all men who lose their tempers have ginger hair "). This kind of jolly, easy, but illogical, thinking creates all the funny old-wives' tales which most of us accept as gospel, and makes us hold emphatic views with a blithe disregard for facts, such as the fiction that flogging deters criminals. Now a criminologist could never say such a thing, because he is a specialist who cannot, if he is to earn his keep, ignore certain (in this case) quite elementary statistics. But he probably holds equally quaint views outside the field of criminology.

Since we occupy ourselves in our Society with matters entomological primarily for the sake of our amusement and personal interest, I think we need not lay too much emphasis on being scientific (which, as I say, I am not very clear about from the outset), nor need we be terrified into careful respectability for fear of losing our status as scientific thinkers. Statistics, which comprise a goodly part of any scientific discipline, as a current contributor (P. L. Bradley, 1360) has pointed out, are a bit beyond most of us—not so much intellectually, as beyond our patience—so that we sympathise with the lady who said she could never remember any statistics save one:—If all the people who fell asleep in church were placed end to end, they would be a great deal more comfortable. I asserted a little earlier, without supplying any evidence for this assertion, that a scientific training of mind risks suppressing initiative, enthusiasm and curiosity. After all, there is something damping to natural ardour to be told that an idea must be verified, checked, controlled, correlated, and generally submitted to much mathematical metamorphosing. Where the effect reveals itself most damagingly is in the literature of scientific periodicals in which the language used becomes what I can only call " dehydrated." The expression of the self is squeezed to extinction, which usually means that the literary style is execrable, or, if not that, then ponderous, or flat, or obscure. It all reduces itself to a sort of formula, like the geometric theorems that had to be done in class: " Given: Prove: Proof."

Perhaps these things are necessary in a world of concentrated specialisation, but I hope it will not be found necessary to ape the style in our own *Bulletins*. Enthusiasm, imagination and conjecture are the feelings we have when we see our first insect under a piece of bark, or rear some larva in a jam-jar, or read an author who stimulates us to further ideas. If we allow ourselves to put down in writing these spontaneous thoughts, most of which will find their way past the sympathetic and benevolent blue pencil of the Editor, we can contribute material which is more worth-while because it will contain greater liveliness, depth and style. It is, I believe, a mistake for a Society such as ours to disguise itself too frequently behind the false whiskers of scientific detachment. We wish to know neither more and more about less and less, nor less and less about more and more; we want to communicate interestingly about our knowledge, experience, ignorance, and pleasure.

Some of the most profound and lasting documents in science have been written with simplicity, humour and personal anecdote—consider but a few famous authors in diverse scientific fields—Eddington, Hogben, Fabre, Cheesman, Forel, or Mead.

It is quite true that, in order to tackle a problem scientifically, we have to remember that one swallow doesn't make a summer, but one swallow is a great source of joy to the lover of birds.

A. N. Brangham (18).

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EDITOR'S ADDRESS

Please note new address given in AES Notice on inner front cover.

THE BLUES GROUP

I received over thirty letters from members of the group last year, and many kindly sent me specimens of *Polyommatus icarus* from various localities. I now have a small series for the study of geographical distribution from 25 counties and islands—the examples shown at the Annual Exhibition revealed how wide is the variation between local forms.

Although the membership of the group is small, I do hope many more will come in and help to assimilate information on distribution and other important factors. We particularly want members from Scotland, Wales and N. Ireland.

Last year I asked if any member knew if *P. icarus* was present on Lundy Island—the information is to hand, it was observed there this year!

All my correspondents said 1952 was one of the worst years for blues for a very long time. Some species were almost absent in localities as far apart as Westmorland and Sussex. *C. argiolus* was probably the most scarce; only a few Spring insects were seen and the Autumn brood was practically non-existent. *P. argus* was scarce in most places; *A. agestis*, *C. minimus* very scanty in the south, the former being in larger numbers in the north of the country. *L. bellargus* had another poor year, just a few Spring brood with a slight increase in numbers in the Autumn. *L. coridon* was fairly plentiful, but not quite so numerous as in 1951: although a few good varieties were taken, it was certainly not a good year for variation. *P. icarus*, as usual, appeared in varying numbers, though it was not at all common anywhere: nevertheless, a few specimens could normally be found in suitable localities.

The paucity of *P. icarus* in some years is most difficult to understand. The fluctuations in numbers from year to year, even Spring brood to Summer brood, must be due to various factors and will need intensive study to be fully understood. It has been generally assumed that *P. icarus* is treble brooded in the southern counties in good years—I am rather doubtful about this assumption and think that there may be only two broods with emergences from the second brood delayed over a lengthy period. It is nearly always possible to find some butterflies of this species throughout the months of August and September and part of October in the south during reasonable weather.

I was fortunate in breeding out a male *caeca* from a second brood batch of *P. icarus* on the 12th August; a pairing was obtained from the same brood and part of this F_2 generation began emerging in mid-November 1952 in a heated breeding cage. Most of the larvae of this brood went into hibernation before the end of September and it was difficult to find many to place in heat, although I noticed that one or two larvae were feeding outside in natural conditions on the 4th November.

R. C. Dyson (91).

PUPAL EMERGENCE TIMES

During the past year or two several members have sent me interesting observations which they have made regarding times of emergence from pupae. Already I am able to piece together some parts of the picture, but before I can publish even a preliminary report I must have more information. I am sure that many members must have noted newly emerged insects, or recorded the times at which their bred specimens emerged last season. If you have made any such notes, please send them along, stating whether the insects concerned were in the natural condition or bred. If bred, I would like to know exactly under what conditions they were kept prior to emergence, such as whether the pupae were exposed or covered, or whether the cage could receive direct sunlight at any time of the day, etc.

If you have any theories send them in too. Remember, this is group work and not just a private experiment.

P. L. Bradley,
69 Manor Road, Barnet, Herts.

OVERSEAS EXHIBITS

In our report on the Annual Exhibition, 1952 (*Bulletin*, Vol. **11**, p. 109) we promised a fuller account of the exhibits shown by overseas members. They were the following:—

Lepidoptera.

G. W. Gibbs (1212*), New Zealand. *Vanessa gonerilla.*

W J. Gray (1843), Nyasaland. *Danaida chrysippus*, *Hypolinnos misippus*. (Mimicry).

G. Hesselbarth (1761), Germany. Series of *Pieris bryoniae* ssp. *flavescens*.

A. M. Holmes (1198), South Africa. *Thestor holmesi* Van Son. Speci-

men taken in January 1950 at French Hoek Pass, when it was a species new to science.

R. R. Irwin (1220), Illinois, U.S.A. *Basilarchia disippus*. (Mimic).

J. A. Keji (571), New York, U.S.A. *Cercyonis pegala*, *Euptychia cymela*, *Alypia octomaculata*, *Euthisonotia unio*, *Hadena arctica*, *Catocala obscura*, *C. mira*.

Dr. T. Norman (68), Upper Assam. *Sticophthalma camadera*.

A. L. H. Townsend (1691), Kenya. *Ludia hansali*; *Clania* sp. ? *modermanni*, a psychid with larval cases made of twigs of *Rhus glaucescens* and *Acacia abyssinica*; larvae of F_1 generation of *Bombycopsis conspersa* reared in London from ova from Kenya.

T. Trought (1373), Jordan. 17 specimens including *Anosia plexippus*, *Eumenis piridice* and *E. telephana*.

A. Valletta (1879), Malta. *Gonopteryx cleopatra*, *Euprepia pudica*.

Coleoptera.

Dr. F. H. Uther Baker (2011), W. Australia. *Leptopius biordinatus* var. *raucus*.

M. Isbill (2026), Georgia, U.S.A. 16 specimens of N. American beetles.

D. F. Pickard-Cambridge (2052), S. Africa. *Oryctes boas*, *Callichroma natalense*, *Rhabdotis aulica*, *Cybister immarginatus*.

A. J. Roudier (1294), France. 11 specimens.

R. Vieujant (898), Belgium. *Chrysocarabus auronitens* with ssp. *festivus*, abs. *purpureorutilans*, *holochrysus* and *violaceopurpureus*.

Many of these specimens were striking in either curiosity or beauty. Exhibitors had agreed that their contributions should not be returned to them, but either be presented to the British Museum (Natural History) or given away after the Exhibition. Junior members attending the Exhibition put their names into a ballot box and lucky ones went proudly away bearing exhibits, having promised to write personal letters of thanks to the donors.

We hope that we may have an even bigger display next September. Since there is time for it, perhaps every overseas member will find something to send. Mr. Byerley reports that he has two in hand already!

L. W. S.

SCIENTIFIC METHOD IN ENTOMOLOGY (3)

(*Continued from Volume 11, p. 111.*)

In the previous two parts I outlined some of the general concepts involved in making a logical and scientific approach to biology. I want here to get a little nearer to entomology and illustrate these more abstract concepts by reference to a specific problem, namely the study of insect communities.

A species of insect, however widespread it may seem to be, is usually divided up into a number of communities separated from one another by barriers which often seem trivial to us. It prefers certain breeding sites and occurs there year after year without straying far from its native haunt. If individual breeding sites are a long way apart, very little intermixing will occur, but often there is a certain amount of overlap.

If we have a fairly isolated community of insects, we can study many aspects of the biology of this insect such as its life cycle, its relative frequency from year to year, the overall number of insects at any one time, the birth rate and death rate, any migrations which may occur, possible subspeciation from one community to another and a whole host of other interesting questions which, when elucidated, all add up to an intimate and detailed knowledge of the insect concerned — knowledge which, by the way, is much more interesting and valuable than a series of dead and dried specimens in a drawer of our cabinet, however beautifully set they may be.

Now, suppose we have chosen a community of insects for our study, let us first investigate the numbers of insects of which it is composed. Our experiment may be immediately divided into two topics, namely, the relative number of individuals from time to time, and the absolute number at any one time. Taking the fluctuations in density of our community first, we may have noted from general observations that the number of individuals on the wing varies at different times of the day, also from one day to another according to weather conditions, from one year to the next, and also there will be a general rise and fall in numbers during the season as hatching takes place.

We may have kept careful notes of all these happenings over a period of several years, but nobody will be very convinced by our results unless we can

add weight to them by giving actual figures. In order to obtain such figures we must count the insects in some way, and generally speaking the easiest way to do this is to catch them. A number of ingenious methods have been used, such as allowing them to drift with the breeze into a special net with a closing mechanism at the bottom, or, for very small species, by catching them on a moving fly paper as they drift with the wind. For nocturnal insects the light trap is perhaps the most efficient. A good all-purpose method for small, plentiful insects such as mosquitoes, is to make a number of standard sweeps in the air with a net while walking a measured distance. After each series of standard sweeps the contents of the net are counted.

Whatever the method we use it must be standard and repeatable in exactly the same way on any occasion. Remember, our insect community is the population and we are taking a sample from it, so if our samples are to be truly comparable they must be obtained in precisely the same way each time. The actual duration of the trapping must be timed to the minute and not just guessed at, or worse still prolonged a little in the hope of catching one or two more. We must work like a machine, for in sampling there is no place for the human element.

These methods will give us good information about the relative fluctuations in our population, but of course they can tell us nothing about the absolute number at any time. In this type of problem there is nothing for it but to use some statistics.

The first approach to this problem is interesting for the simplicity of the theory behind it, although it is not of much practical use in entomology. Suppose our insect community is small, and during the period of the experiment the birth rate and death rate remains the same. Now if we catch a large number of these individuals the size of the community will have been correspondingly reduced, and next time we try we will not be able to catch so many. This second attempt will reduce the numbers still further, and if we continue day after day, we will eventually reach a point when our standard trapping procedure will catch a much smaller number than it did at first. Thus the trend of this gradual decrease will give us a direct measure of the total number of individuals. Those interested in the method of working this out should consult the paper by Moran (1951).

The second method, and the one most frequently used in entomological work, consists in capturing a certain number of individuals (the actual procedure we use need not be standardised), marking them and then releasing them back into the community. We now give them time to mix quite randomly into the community, and then take another sample and count the number of marked insects in it, expressing this number as a percentage of the total sample. For the sake of argument, suppose we catch 100 insects. We mark each one and release them. After two or three days we catch another 100 and find that out of this sample 2 are marked. We thus infer that our first catch of 100 represented 2 per cent. of the whole community which must therefore consist of 5,000 individuals.

By marking and releasing on a series of different days and using a different mark for each day, we can estimate the birth rate and death rate and average life span of members of our community. Of course I have over-simplified the details, and no account has been made of error which is inherent in all such experiments. For instance, one sample may contain two marked specimens, but the next may contain five, and the next three and so on. In working out our results all this must be taken into account, and in writing down our conclusions we must not say "The population consists of 5,000 individuals", but something rather like this: "The population may be expected to lie between 4,850 and 5,150," the scatter being calculated from our experimental results. (For further reference see Dowdeswell, Fisher and Ford (1940), with refinements by Bailey (1951)).

Another point which we may be interested in is the degree of isolation of the community. If it has been well isolated for a long time the individual members will probably show certain slight differences from individuals of another district. These differences may not be apparent to the unaided eye, but will become obvious when some special factor we have chosen is compared throughout large numbers of insects.

Dowdeswell (1952) has shown that in the British Isles the butterfly *Maniola jurtina* may be divided up into a number of distinct races de-

pending upon the number of spots present on the underwing. There are many such factors which can be chosen as an indicator for detecting these differences, and it is up to our ingenuity and experience to choose a suitable one. There is no room here to go into the reasoning used in developing these ideas, but those interested are strongly recommended to read Dowdeswell's paper quoted above.

There are many entomologists who believe that it is fundamentally impossible to apply mathematics to the study of living things. Others contend that statistics are used by certain unscrupulous scientists in order that they may prove some point which other workers, less knowledgeable in the mathematical manipulations, would be unable to dispute. Both contentions are wrong. Firstly, it has been shown time and again that biology is just as suitable as any other branch of science for the application of mathematical concepts. Secondly, one cannot *prove* anything by the use of statistics. One can only demonstrate the significance of a result (that is to say, how often we expect to get such a result by pure chance), and the degree of error inherent in our experiment.

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(To be concluded.)

P. L. Bradley (1360).

COLEOPTERA OF WOOLMER BOG

I presume that all coleopterists know their "Natural History of Selborne," with its many references to Wolmere Pond and Forest. But how many, on their habitual pilgrimages to Mecca (New Forest), have ever considered it as an extremely abundant locality for Coleoptera?

I have worked this area for four years, and on only one occasion have I met other collectors. For the benefit of anyone seeking a new ground, I give a concise description of the locality and a short list of some of the more notable finds.

There have been many changes since Gilbert White's days. Wolmere Forest is now split into several large heaths and much of it is now given over to farming. Some of the heaths are bare, and in parts boggy, and others are heavily wooded with Scots Pine. The Pond has been reduced to a marshy stretch of land, known locally as Woolmer Bog. It is roughly 60 acres in extent, but some of this is inaccessible owing to W.D. restrictions. It consists of a central area which contains both clear and peat-pools. This is surrounded by dense masses of Bulrush and Sallows. Around the outskirts comes a deep belt of Mosses which finally gives way to heathland. During a dry spell in 1952 it was possible to penetrate very deeply into the heart of it, where many Hydradephaga, hitherto unseen, were found in the dried pools.

Of comparative rarities I have taken the following:—

Geodephaga: *Carabus arvensis*, *C. monilis*, *C. nemoralis*; *Pristonychus terricola*; *Patrobus excavatus*; *Agonum ericeti*, *A. gracilis*, *A. oblongum*, *A. sexpunctatum*; *Pterostichus lepidus*; *Harpalus rubripes*, *H. rufitarsis*; *Stenelophus vespertinus*; *Acupalpus elegans*; *Anthracus consputus*.

Longicornia: *Aromia moschata*; *Criocephalus polonicus*; *Leptura rubra*, *L. cerambyciformis*, *L. quadrifasciata*; *Prionus coriarius*.

Rhynchophora: *Eccoptogaster ratzeburgi*; *Nanophyes gracilis*; *Pissodes castaneus*.

Sternoxi: *Corymbites tessellatus*; *Elater sanguinolentus*.

Hydradephaga: *Acilius canaliculatus*; *Colymbetes bistriatus*; *Dytiscus circumflexus*; *Hydaticus cinereus*, *H. seminiger*; *Hygrobia hermanni*.

Clavicornia: *Glischrochilus 4-punctata*; *Hister marginatus*; *Omosita depressa*; *Parnus prolifericornis*; *Pediacus depressus*; *Pocinolus murinus*.

Malacoderma: *Necrobium violacea*.

Heteromera: *Pyrochroa coccinea*.

I shall be pleased to accompany anyone who wishes to work the spot, if he gets in touch with me. It must be before June, because I am leaving the district then.

Finally, I should like to place on record the willing help, for iden-

tification purposes, of the AES members, G. H. Ashe, D. Tozer, and J. Cribb.

S. E. Allen (2001).

SHEPHERD'S LORE

I was greatly interested in the article, " A series which took twelve years to achieve," by P. Le Masurier (*Bulletin*, Vol. **11**, p. 98), because it brought vividly to my recollection a somewhat similar experience of mine in the same locality and with the same species.

In the Summer of 1937 my wife and I took our holiday, during the first two weeks of July, at Windermere. On three separate days I took the morning bus up to the Inn on the top of the Kirkstone Pass, with the intention of climbing one or other of the surrounding mountains, where I had been told that *Erebia epiphron* had its haunts. When I arrived I found a collection of cars, buses and lorries standing while their boiling radiators cooled. Each day, on my arrival, I saw the tops of the mountains were hidden in thick mist; though I remained up there several hours each time, the mist did not lift. The radio weather forecast had been " Fine, warm and sunny." Down on the lowlands that was correct. So, abandoning the weather prediction of the meteorologists, I put my faith in that of a local dweller in the mountains.

The last full day of our holiday had come (14th July). With little hope, about 9 a.m., I telephoned the innkeeper on the top of the pass, asking him whether the mist had cleared; his answer was " No." I asked further, " Is it likely to clear?" He replied, " Hold the line and I will ask my shepherd." His unexpected answer came, " He says it will be clear by mid-day." I caught the morning bus, and, my scientific curiosity being aroused, I asked the shepherd how he knew that the mist would rise; he did not enlighten me, but told me to start on my climb. " The mist will be gone by the time you reach the top, and, if it comes down again, keep near the long stone wall and you will come to no harm," he advised me. I went straight up the rocks, and a rough climb I had; but he was right. When at last, rather exhausted, I reached the top, there was no mist and I sat in the sunshine and gentle breeze, ate my lunch, admired the glorious views over Windermere and Patterdale, and finally lit my pipe.

About 1.30 p.m. I set to work. The first catch was a fresh specimen of *Xanthorhoe munitata*; then about 2.30 p.m. *E. epiphron* began to fly, and within an hour I took 8 ♂ and 8 ♀ of them, all fresh specimens, which now adorn my small collection. I could have taken at least 100 of them, but all those not wanted were set free. Luck was with me; I must have gone up just after a mass emergence of the butterflies. Keeping to the wall, near which was a sheep track, the way down became an easy pleasant walk, during which specimens of several species of Geometers were captured; among them were *X. munitata*, *Entephria caesiata*, *Calostigia salicata*, *Lygris populata* and var. of *Cidaria fulvata*. Finally arriving back at the inn, tired but triumphant, I was in time to have some tea and catch the bus down to Windermere. I have seldom had a more successful day, but I take no credit to myself; it was all due to the shepherd.

H. Henstock (209).

REVIEWS

Caddis, by Norman E. Hickin, Ph.D., B.Sc., F.R.E.S. (A Field Study Book), Pp. 50, with four plates in colour and numerous line drawings. Methuen, London, 1952. Price, 9/6.

As stated by the author in his preface, this is the first book in English dealing principally with the immature stages of Caddis flies (Trichoptera).

The author begins with a summary of his subject including the rôle of Caddis flies in Freshwater Biology and the special features which characterize the immature stages, with a short reference to their use to the fisherman. This is followed by a general description of an adult fly, with a key to the separation of the 13 British families, the life cycle, and an illustrated reference to the interesting Hymenopterous parasite which attacks, and appears to be restricted to, three genera (four species) in the larval stage. The next chapter deals with collecting, rearing, and preserving the immature stages and contains many practical hints. Here it might have been a help to have given some method of feeding larvae which might turn out to be carnivorous, to guard against cannibalism as far as possible.

The rest of the book deals principally with larval and pupal morphology and gives two keys to the families in the larval stage (one based on structure and the other, which the author says must be used as a rough guide only, based on their habits) and one key to the pupal stage. The final chapter contains notes on research, suggesting lines of study which might be undertaken. Two appendices include a bibliography and a complete list of the known British species; while on the end-papers will be found a "Laboratory Notebook" giving line drawings explanatory of most of the technical terms which have had to be used.

This delightful little book should be in the hands of everyone interested in aquatic life. It is written in as simple language as could be used on such a subject. When it is realized that the author has so far been able to describe the early stages of only about 35 of our 189 species (no more than 40 are yet known), it can readily be seen that here is scope for an immense amount of original work, indeed a life's work for several biologists. It is hoped that this book will go a long way towards finding those required.

H. W. D.

Transformations of Butterflies and Moths. By L. Hugh Newman, F.R.E.S. Pp. 256. 8 Colour Plates. 146 Photographs. Ward Lock, London, 1952. Price, 30/-.

The book cannot be considered to be happily titled, since the actual processes of transformation are disposed of in a few lines at the end of the author's preface, and a matter of four pages forming the introduction to the book, written by H. B. Williams.

The first 160 pages follow closely the pattern of the author's previous books, "Butterfly Haunts" and "British Moths and their Haunts". Thirty butterflies and forty-three of the commoner moths are dealt with, one opening being devoted to each species. On opposing pages are photographs, many of them of very high quality, of the larva and the imago, captioned with a short description of the markings and coloration of the insect. It is unfortunate, however, that many otherwise excellent photographs show signs of having been 'improved' by retouching. This applies particularly to some of the more hairy types of larvae (e.g. Buff Tip on p. 102).

Whilst the justification for retouching photographs of a more or less scientific nature for the purpose of emphasising salient features is a debatable matter, one feels that some of these have been retouched to the point of exaggeration.

It is to be regretted that in this section of the book, no information is appended to the photographs to indicate the scale of magnification. This obviously varies not only from species to species, but as between larva and imago of the same insect. This is, to say the least, confusing, in spite of the author's note in his preface that "magnification in most instances is of decimal proportions" (whatever that may mean). The usefulness of the measurement of the larva in its final instar, given in the second section of the book, is largely discounted by the absence of any connecting link with the illustrations other than via the table of contents, which in any case is not alphabetical. There is actually no alphabetical index.

The second part of the book consists of notes on each of the species dealt with in Part I arranged in the same order, giving brief but useful details as to size, time of appearance, food plants, and habits of larva and imago. Their usefulness might perhaps have been improved had they been interspersed with the corresponding illustrations in Part I, or at least adequately cross-referenced.

There are eight attractive colour plates by Anthony Moore. These are distributed throughout the whole book, with a page of short descriptions (which, incidentally, duplicate some of the information given elsewhere) placed between the two main sections. A reference to the number of this page on each individual plate would have been helpful.

Briefly, one could perhaps describe the book as something rather more than a picture book, but one having little to satisfy any but the veriest beginner in the study of the lepidoptera. It might well be the choice of a benevolent uncle (not being an entomologist), as a present for a young relative reputed to be "keen on butterflies and moths".

Possibly a clue to the class of reader to whom the author intended to appeal can be found in the fact that he has thought it necessary, in his glossary, to define both entomologist ("student of insect life") and lepidopterist ("student of butterflies and moths").

A. E. H.

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EDITED by W. J. B. CROTCH, M.A., A.K.C.

AES NOTICE
WHERE TO WRITE

Applications for new membership; offers to help with AES work; Exchange Notices to: E. LEWIS, *8 Parry Road, London, S.E.25. (Wants and Exchanges Lists are circulated in March, May, July, and October and notices must be received by the 15th of the previous month.)*

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FEBRUARY 1953

NEW HONORARY MEMBERS

In accordance with Rule 3, the Council at its meeting on 5th December 1952 elected the following to be Honorary Members in recognition of their services to Entomological Science and to the AES. : —

Professor W. A. F. Balfour-Browne, M.A. (340);
Dr. K. G. Blair (197).

It was, therefore, with especially deep regret that we learned of the death of Dr. Blair on 11th December.

Professor Balfour-Browne has expressed his appreciation of our gesture and has made a handsome donation to the Society, for which the Council is very grateful.

●

PRELUDE TO AN EXPERIMENT

It is recorded in *Advances in Modern Biology*, Moscow, **16**: 1, 1943, quoted by *Nature*, 11/11/1944, p. 614, that a Russian experiment in the rearing of *Bombyx mori* on a diet of mulberry leaves to which a saccharose element had been added artificially, had increased the size of the larvae and the yield of silk as well as induced a greater degree of fertility.

At Mr. W. J. B. Crotch's suggestion, members of the AES Silk Moth Group agreed to try the effect of a similar experiment with tropical Saturniidae reared in this country as a hobby.

As amateurs with limited time at our disposal, and lacking apparatus that is essential in the field of research, we cannot expect to produce anything but very generalised results. The most that we can expect to accomplish is the collection of as much data as we as individuals can. If we can show that as the result of this particular treatment the results are better than under normal treatment, we can pass the information on to the expert and professional and leave it to him to provide such details as to which sugar and what percentage of it will produce the most satisfactory results.

Our reward would lie in added interest to our hobby, and perhaps some small acknowledgment that we carried out the preliminary and very elementary investigation which showed that it was worth the time and trouble of the expert to carry our efforts a step further.

Some reflections prior to carrying out the experiment

The method suggested to us was that the leaves be treated with a solution of glucose, saccharose or fructose. The first seems to be the most easily obtainable. Demerara sugar as the most easily obtainable source of saccharose has its drawbacks in view of rationing, while fructose is not only difficult to obtain but is, in addition, very expensive.

According to the Russian figures, the ideal percentage of sugar for the larvae to consume is $1\frac{1}{2}\%$ of the weight of the leaf. The obvious drawback to the painting of the leaves with a thick glucose paste is that the leaf is likely to become a sort of fly paper, especially for the small larvae. A test however showed that privet leaves could be painted quite evenly and dried within about 15 minutes and, further, that, when shaken after drying, the sugar was reasonably tenacious under normal movement.

This meant that an approximate percentage glucose estimation would be possible.

Weight of ' n ' leaves .... x grs.
,, ,, ,, ,, + glucose y ,,

x being 100%, y is a simple calculation.

The chemist of a nearby works kindly promised to carry out the weighings on a pair of very delicate chemical balances and this problem was written off as solved. Care would have to be taken that the glucose paste used would be of a standard consistency and the painting uniform. The actual quantity of food eaten was of no importance as the percentage would be reasonably constant. Inability to ascertain the proportion would not prevent the carrying out of the experiment.

There would be no difficulty in using identical cages in adjacent positions for housing the experimental and control groups, each of which would have an identical number of larvae of the same parentage. The control group would, of course, receive normal food. Logically enough, Mr Crotch had suggested that larvae of a species easy to rear and whose behaviour was well

known should be used for the initial experiment, e.g., *Philosamia cynthia* or *Actias selene.* It appeared, therefore, that the stage was set for the first opportunity that presented itself.

A dress rehearsal

On February 21st., 1952, I received from Mr. Harrison-Gray a mixed consignment of *Cynthia* type larvae of varying ages.

One of the essentials for the experiment is that all the larvae shall be of the same parentage and brood. Though this was clearly not possible with the larvae available, it seemed a good oportunity to have a trial run and see if there were any snags that could not be foreseen.

Accordingly, a dozen larvae in the second stadium of as nearly as possible the same size were selected and divided into two groups. An independent choice of which should be the experimental group was made, and the experiment of feeding one on ordinary privet and the other on privet painted with glucose commenced.

The glucose was mixed into as thick a paste as possible and painted on evenly and thinly on the upper surfaces only. When the glucose dried, the larvae were transferred to it and the two groups housed in plastic containers. The experimental group accepted their new diet quite readily, and the following day both groups settled down for their second moult. This was accomplished with the experimental group leading by a very small margin. For a haphazard selection from a mixed stock, it seemed that a very level start had been arranged.

Snag No. 1 had become apparent before the moult was completed. As the humidity inside the cage increased, so the glucose absorbed the moisture and ran off the leaves. If this continued, any weighings that were made to obtain a percentage sugar content would be valueless. By part-ventilation of the cage it was found that the sugar remained in a solid state, though perhaps on the moist side. Both cages were given the same ventilation and some of the humidity sacrificed.

Snag No. 2 was that after a time the glucose got too dry and some flaked off and fell to the bottom of the cage as the larvae crawled about and ate the leaves. The larvae were consuming a very large proportion of the glucose, but at the same time the flaking off would again upset calculations made from weighings. It is quite probable that by a controlled system of ventilation the sugar could be kept at the required solidity to make it hang to the leaf while it was being eaten. As I could not give constant attention to the cages in order to open and close the vents, I had to rule this out.

At the third moult the control group were a couple of days ahead of the experimental group and this time-lag increased, until at the spinning-up stage the experimentals were seven days in arrears. This in itself was of no great importance if there was anything to show for it. Unfortunately, there was no apparent difference in the sizes of the larvae nor in the apparent amount of silk spun. The only difference that I could detect, and I freely admit that I would not like to swear that it could not have been imagination, was that at times the larvae that had had the glucose diet seemed to be much whiter, as if possessing a heavier coating of the waxy powder which is a characteristic of the species.

Anyone who has tried this method will have found out that it is very messy. I felt that it was not worth carrying out the real experiment on these lines unless some definitely improved results were obtainable. Without waiting to see what sort of moths would emerge, I decided to look around for other methods of impregnating the leaves with sugar. The obvious alternative was a method of absorbtion.

A second attempt

Apart from the unsatisfactoriness of the method of actually applying the sugar, the glucose used was a medicinal type containing compounds of calcium and phosphorus, together with vitamin D, and though consumed by the larvae, it had not produced the results we had hoped for. It could be that by being absorbed into the leaf some chemical change akin to our digestion might take place, which would make it more acceptable to the larvae; or it might be that the other ingredients counteracted the good done by the glucose.

In searching round for other types of natural sugars I found that grape sugar, sold commercially as Dextrose, was a natural leaf sugar and decided to try this.

Furthermore, I felt that until a sugar and method of application had been found that would show improved results over the normal feeding, detailed observations might be omitted.

By this time I had obtained two pairings of *P. cynthia*, the progeny of

one feeding on privet; of the second on lilac.

The first effects of standing sprays of the two foodplants in a solution of dextrose were not encouraging, because within half an hour both had wilted in a really alarming manner. Some two hours later, however, there were signs of a revival and by the following day, when they had been in the solution for twenty four hours, they were standing up so rigidly that they looked unnaturally fresh and the growing plant appeared limp beside them. This was encouraging and I think justified hopes of better results.

Control and experimental groups from both pairings were started once again and the foodplant for the experimental groups allowed to stand in a solution of dextrose (one dessertspoonful to half a pint of water) for at least twenty-four hours. The control groups were given fresh food.

After the first day or two it looked as though those on the dextrose diet were going to leave the normally fed larvae standing, but from the second moult onwards there was nothing to choose between the experimental and control groups taken as groups. One of the controls was the first to spin up, but this was counter-weighted by the fact that the experimental group completed its spinning a day or so ahead of the controls. There was no visual difference in the size of either the larvae or the cocoons.

The moths emerged in due course from cocoons which had been carefully labelled. Those from the experimental group were certainly fine moths, but no better than the best normally obtainable. Emergences were irregular and it was not possible to obtain a pairing of those that had received dextrose feeding.

Conclusions

On the face of it there was no appreciable return for the amount of time and trouble that had been expended. It cannot be overlooked, however, that the amount of dextrose actually absorbed into the system of the larvae must have been very small indeed.

Some slight compensation may have resulted from the feeding, because a female that had received dextrose after being paired with a normal male laid 423 ova in two nights—considerably more than the average; while an experimental male which was paired with a normal female for 23 hours paired with a second female that was free in the greenhouse within ten minutes of breaking with his first partner and remained paired for a further 22 hours. It might have provided useful information if I could have reared some of these two groups, but it was beyond my rearing capacity.

It is, of course, a recognised fact that this species pairs very easily, but at the same time I think it may be true to say that the sugar treatment increased the vitality and stimulated the fertility. This is only an impression as there is obviously insufficient evidence to formulate a definite conclusion. In all other respects the experiment did not produce any encouraging results.

From time to time as opportunity presents itself, I shall make further trials with other species. It may be that some species that are normally not very easy to pair will do so more readily if given a diet of one of the ——oses. The real problem at the moment is how to administer the ——ose, so that a reasonable quantity will be consumed. It looks as though the original method of painting the leaves will have to be resorted to.

W. R. Smith (1641).

WATER BUGS COMING TO LIGHT

I live at Bedfont, Middlesex, and use an eighty-watt white mercury vapour lamp in my trap, which is situated in the middle of the garden. There are two rivulets about forty yards away on either side and gravel pits to the South, East, and North-West, the nearest being about one and a quarter miles away. Some three miles away are two reservoirs, close together. It may be for these reasons that in mid-1952 I had quite a large number of Corixids in my trap.

When they first arrived I failed to count them and, perhaps, even to notice them. Later I began to compile data. The following sequence of numbers gives an approximate idea of my captures starting on June 29th and finishing on July 26th 1952 (the interpolated x's indicate nights without observation): —

12, 30, 50, x, x, x, 100, x, x, 100, 300, 500+, 500+, x, x, x, x, 500+, x, 150, 130, 80, 120, 70, nil, 50, 20, 2.

Some rather cooler weather followed and no more were seen till August 30th.

On the nights of the biggest intakes, I got no further than 500 in my counting, but there were possibly more than twice that number on the lawn, for when one held a torch close to the

ground one could see water bugs jumping about everywhere in the torchlight.

I shall be pleased to give fuller details to any member who may be interested.

ALAN KINDRED (1707*).

THE CHANGING SCENE (1)

One of the interesting—and at times exasperating—features of a study of local variation in colonial species of insects is the rapidity with which information becomes out of date. Sometimes this is the case almost as soon as the information is given. A case in point is the article by me which appeared in the August 1951 *Bulletin* of the AES (**10**, 86-87) in which I gave an account of Cumberland colonies of *Euphydryas aurinia* Rott. (the Marsh Fritillary). The picture has changed greatly since that article was written, and it may be of interest to give details of these changes. The information given there was based on observations up to and including 1950. Personal circumstances made my usual annual visit to the colonies impossible during 1951, though I have gleaned a trifle of information about the conditions that year. This article concerns personal visits to the colonies in 1952 and it will be best to discuss the matter under the same headings as in my previous article, so that it would be superfluous to give physical details of the altitude, location and distance of separation of the colonies again here.

(A) The species here had suffered an almost complete collapse. Its previous super-abundance was abnormal—one might almost call it pathological and there was bound to be some reaction. The numbers were, I gather, greatly reduced in 1951, but last year one was hard put to it to find half a dozen specimens where in 1950 there were many thousands. Needless to say, the specimens seen were typical, and one only hopes that the factors which made for the amazing variation in this colony will survive in the genetic make-up of the surviving specimens and will blossom forth again when the conditions become favourable for the species to multiply once more. Other observers have seen this colony dwindle almost to vanishing point; and each time there has been a spectacular recovery. The whole process is shrouded in mystery—there has certainly been no human interference, direct or indirect; there has been no sign of abnormal parasitic activity—with a careful search I saw 3 parasitized larvae last year; food plant was clearly in short supply in 1950—but so it was in previous years when the butterfly was very abundant, and in any case this could hardly by itself be responsible for an almost total collapse; 1951 was a year with a cold late spring—but so were 1947 and several other fairly recent years. It would be most interesting to know if any other colony has similarly collapsed at the same times. I have heard from various sources that 1952 was a bad year for *E. aurinia*, but I have heard of no instance parallel to that which I have just outlined.

(B) Numbers here have slightly declined, but the species never was very numerous in this colony—at least in recent years. The interesting feature was that the colony had shifted to the far corner of the next field westward (a very large field) not a specimen being seen in the field which had previously been its headquarters. The luxuriant growth of the food plant was completely uneaten here. The shift of the population is not the end of the story, for the predominant form had changed, and the striking large bright red specimens had given way to much smaller duller specimens not nearly so unusual or so distinct. I examined every specimen I could find in 1952 (needless to say, releasing them afterwards) and I could not trace one which was of the previously predominant form.

(C) I was unable to spend more than a short while at this locality. The sun was shining, but the wind was keen, and I did not see a single specimen. I am not yet of the opinion, however, that it has become completely extinct, as the food plant had been eaten a bit here and there, and *E. aurinia* larvae may well have been responsible. I shall hope to visit the place again next season.

(D) Numbers were considerably reduced here, though not so drastically as in Colony A, and there is at present no danger of extinction. The colony seems to be in process of shifting to the other side of the road, though the shift is only partial at present, and, so far at least, is not associated with any change of outward appearance such as has occurred in Colony B.

(E) In spite of its situation at almost 1000 ft. above sea-level, this colony had been the least affected by whatever adverse conditions they are which had so seriously depleted numbers elsewhere. There was apparently some reduction in numbers, but not to an

alarming extent; and the colony was still occupying the same headquarters as before.

It would be most interesting to know exactly how widespread the present decrease in *E. aurinia* really is. It would be also interesting to hear of observations which might throw light on the regularity or otherwise of these fluctuations in numbers in any particular colony or group of colonies. This species is in many ways an extremely interesting one and what is really needed in the first instance is that a visit should be paid annually to all the known colonies by local naturalists and their reports collected and compared. It would be useful too if a very small sample of insects (say, 2 males and 1 female) of the form typical in each colony could be collected for comparison. All this is probably a vain hope, but it is worth throwing out the hint, for the results would be most fascinating and instructive.

(*To be concluded*).

J. H. Vine Hall (1520).

LOCAL VARIATION

I refer to the Rev. J. Vine Hall's article in the *Bulletin* (**10**, 44 et seq.) on "Problems of Local Variation." When I went to West Cumberland in 1952 I found a colony ten miles south of St. Bees, which differed in several important ways from those of the St. Bees locality.

The Grayling

(a) *Size.* St. Bees, normal or larger; second locality, normal or smaller (particularly males with whiteness).

(b) *Colour of underside.* St. Bees, black and white (see article under reference); second locality, very variable, all shades of darker browns and also albinos numerous.

(c) *Spots.* St. Bees, as described in article; second locality, specimens with three spots on upper wings almost as common as type; four spots with extra on hindwings not rare.

(d) *Situation.* St. Bees, exposed; second locality, sheltered.

Perhaps this proves that the situation does not always account for variation; for, even though they would never leave the seashore, the situation for miles around was hot and windfree on account of the mountains surrounding it.

The Wall Brown

The dark suffusion occurs widely round the valleys of Eskdale and Wasdale and along the coast. It probably occurs in other valleys, too.

The Meadow Brown

In the second locality, females frequently have a small unpupillated spot beneath the apical spot on the underside. I did not find this in any male there.

The Gatekeeper

Was not to be seen. It occurred sparsely inland.

A. E. Wright (1666*).

ARTIFICIAL HIBERNATION

At the AES Exhibition, held in late September, I gave a demonstration of setting butterflies. The species used were Red Admirals (*Vanessa atalanta*), which, being in perfect condition, gave the appearance of freshly emerged insects. This was not the case, however, many having been in captivity a month.

Great interest was shown by those who had gathered to see the setting, when told of the method adopted to keep the insects alive and in this condition until 48 hours prior to the demonstration.

For those who did not attend, but may be interested, I might explain that the insects were put in glass bottomed boxes 12 hours after emergence, and these were placed in a large biscuit tin. The tin contained a small basin with a few ice cubes. The boxes were touching the sides of the basin so that the effect was to produce a state of semi-hibernation. The temperature was generally 35°-40°F. Naturally the ice melted after a few hours and had to be replaced from the refrigerator. A small wad of cotton-wool soaked with a sugar solution had been placed in each box, but the insects were in so torpid a condition that they showed little interest in feeding.

After a month, nine specimens were despatched by cyanide and remained in the killing jar for 48 hours, after which they were in perfect setting condition. The rest of the butterflies were released and did not appear to have suffered in any way.

S. M. Hanson (320).

PUPAL PERIOD OF A LONGICORN

In September 1951 I found two larvae, and two adults, of the Longicorn beetle *Rhagium bifasciatum* in a small Pine stump on Limpsfield Common, Surrey. The larvae I put in a large tin with some of the wood.

I must admit that at the beginning of August 1952 my curiosity got the better of me and I turned out the contents of the tin to find that one of the larvae had pupated. In order to be able to keep my eye on it, I placed the pupa, with the other larva and some of the decayed Pinewood in a glass jar. The jar was put back into the tin so that the condition of darkness should be as before. The second larva very conveniently made its little pupation chamber on the bottom of the jar. I was thus able to note with certainty that it pupated on 3rd August and that the adult emerged on 24th August, giving a pupal period for this individual of twenty-one days.

In both reared specimens the abdomens were very much distended posteriorly, extending about 3 mm. beyond the ends of the elytra.

P. F. Prevett (1802).

SWALLOWS AND LEPIDOPTERA

For the last two years Swallows have nested in my garage over my car. In spite of a dropping tray, I have found a variety of insects (and less desirable things) on the bonnet each morning. Among these in 1952 were two *Thecla quercus* (Purple Hairstreak) and a male *Orgyia antiqua* (Vapourer). All were in a sad and semi-moribund state. I wonder what other species of Lepidoptera are taken by these birds. Of ornithological interest only is the fact that the second brood young returned to roost in the garage each night for a month after they were fledged; the parents did not accompany them. Is this normal?

John E. Knight (94).

REARING THE WATER CARPET

I obtained a batch of ova of *Lampropteryx suffumata* last year and reared them successfully on Goosegrass (*Galium aparine*) until the time for pupation. Various books consulted stated that the pupa is subterranean, so I provided the full-grown larvae with earth in which to bury; but instead of going down, they just wandered about. Some formed pupae on the surface, but many dried up before the change. I found the most healthy pupae amongst the stalks of the foodplant where it entered the water bottle. The stalks were too tightly packed for the larvae to enter the bottle and drown, but the conditions were very moist. I should be interested to know if others have had difficulty in rearing this moth. My theory, for what it is worth, is that *suffumata* inhabits damp places and the normal site for pupation is on the surface of the earth, but under a layer of wet dead vegetation.

John E. Knight (94).

POWERS OF SURVIVAL

On 16th July 1952, a "hawk" larva emerged from an ovum taken on sallow in Cumberland. Hoping that it might be an Eyed Hawk, more rare here than the Poplar Hawk, I kept it. On 27th August it escaped from the breeding cage by pushing aside a rubber "stopper" covering a hole on bottom of cage. I found it, apparently drowned, in the jar underneath. I had not yet provided earth because it had not shown signs of pupating. Having read that larvae sometimes survived such immersion, I left it on soil and after twelve hours it had recovered and gone under, where I found it full of life. I do not know how long it had remained under water—not more than six hours.

R. H. Benson (1444).

ADVISORY PANEL

Mr. Arthur F. Peacey, who has just joined the AES, has kindly offered to act as an adviser or Neuroptera and Trichoptera. Will members make a suitable entry on p. 76 of the Membership List (*Bulletin*, Vol. **11**, No. 139). Mr. Peacey's address is "Hillside," Brimscombe, Stroud, Glos.

MICROSCOPY GROUP

The Microscopy Group has made a flying start. They are circulating among themselves a regular private bulletin every two months which embraces articles, hints, questions, and answering advice. They are also preparing slide-boxes and suitably proportioned note-books for the circulation of slides prepared by Group members on particular subjects. An instruction scheme is in operation to help beginners with mounting, etc.

The Editor has invited the Group to advise on the preparation of an AES Leaflet on "The Entomologist's use of the Microscope."

Mr. Ison (1343) states that the Group could absorb a few more members. He will gladly send particulars on receipt of a stamped addressed envelope.

SCIENTIFIC METHOD IN ENTOMOLOGY (4)

(*Continued from p. 6*)

By way of concluding this series of notes, I would like to describe a few of the ways in which insects have been used to elucidate problems of a more general nature.

The specialist entomologist tends to regard his insects as a unique form of life, quite different from mammals or birds or fishes, and not to be compared with them in any way. He tends to lose sight of the fact that insects are highly organised living things which have a nervous system, and a reproductive system, and a digestive system, just as have the higher animals.

Morgan, the famous geneticist, required some organism which bred rapidly, could be easily kept and handled, took up little space, yet was well suited for genetical analysis. By some stroke of luck or intuition he decided upon the fruit fly *Drosophila*. The wisdom of this choice is shown by the fact that nearly fifty years of research have been carried out on *Drosophila*, and it is in ever increasing use at the present time. Almost the entire findings of the work on *Drosophila* have been found applicable to other forms of life, including human beings.

Physiologists, who usually use the cat and the rabbit for their experiments, are beginning to turn to the insect for the elucidation of certain problems. In studying the mechanisms of transmission of nerve impulses to muscles, the insect has certain clear-cut advantages over the mammal, not the least of these being the fact that it is unhampered by thought processes and other mental phenomena, and as a result it tends to behave with machine-like regularity. A controlled stimulus is much more likely to produce a predictable result in an insect than it is in a cat. The small size of the insect is a disadvantage, but one which can be easily overcome.

This automatic behaviour which the insect shows has attracted the attention of the psychologist, and a study of insect behaviour-patterns when faced with certain standard situations has been fruitful. It has been shown that many insects never really learn by experience, so they can be fooled almost indefinitely.

Forestry is a subject which cannot be studied apart from entomology. The tree may be considered as a biological unit living and growing in an environment, and quite a large part of this environment consists of the insect pests which impede its growth in various ways. Therefore, a study of the interaction between the tree and its environment is an essential part of the study of forestry.

Work on insect variation has made a considerable contribution to the present-day knowledge of evolution. Insects are a fairly recent phylum in the geological record and are still undergoing such a rapid expansion and adaptive radiation that evolutionary trends can be detected at the present time. Thus it is possible to see new species evolving almost under one's very nose.

All these topics really come under the heading of applied entomology, and in this case the insect tends to be regarded more objectively. There are many problems which are unique to insects, but even in pure entomology one must constantly guard against taking too subjective a view of the insect. It is not possible to make a scientific approach to the study of insects if we endow them with human faculties.

The entomologist of fifty or sixty years ago liked to talk about the Wonders of Nature as if any organism were endowed with a deep and mysterious sagacity, compared with which the human mind was but foolish and blundering. This attitude no doubt accounts for the fact that no real progress was made in, say, insect physiology until the last decade or so.

If we continually bear in mind the fact that an insect is a machine, quite unable to direct the course of its own destiny beyond a crude routine of avoiding reactions when presented with suitable stimuli, we cannot get led too far astray in constructing and interpreting entomological experiments.

Those who wish to carry out some experiments on insects are strongly recommended to read the chapter on insect behaviour in V. B. Wigglesworth's "Insect Physiology." This gives an excellent account of the sort of work which has been done in this field, and the problems which are presented. For those interested in the statistical side, an excellent theoretical background can be got from M. J. Moroney's book "Facts from Figures" (Pelican Books, 5/-).

P. L. Bradley (1360).

NOTES ON A MIGRATION STREAM

On the coast of South Cornwall the entomologist has many opportunities to watch the come and go of our migrant butterflies. As he walks the cliff paths on any day between April and October, he notes the advent of *Vanessa cardui, Vanessa atalanta,* and *Colias croceus.* He sees the numbers increasing from twos and threes to flutterings and dartings of colour beyond his ability to count. He notes their peak periods and their decline, and sometimes their almost complete elimination by a roaring gale from the Atlantic, which blasts and burns the herbage, and turns the beauty of yesterday to shrivelled and withered death. He comes to know where to look for the first arrivals, the particular place or places along the coastline he has under observation, where experience tells him he will be most likely to find them. He may, if he is fortunate enough to be at the right spot at the right time, see them flying in from the sea. When this happens he records it as a noteworthy event rather than a commonplace occurrence. It is even more unusual for him to find himself in a migration stream.

On September 11th, 1952, I was at Prah Sands; the day was hot and sunny, the sky clear and the wind blowing moderately from the N.W. The Sands face roughly South, and on the land side rise to low dunes. About 1 p.m. (B.S.T.) I was sitting on the shore close to these dunes, and with my back to them, and became aware, after a little while, that butterflies were passing me at fairly frequent intervals. At 1.30 p.m., having realised that this was, in fact, a migration stream, a count in quarter-hourly periods was begun, and continued until 3 p.m. Only those butterflies that passed within a few feet of my position, which remained unchanged throughout the whole observation, were included. All were flying N.W., that is, against the wind.

The total, when placed in comparison with the vast migratory flights which take place in other lands, may seem insignificant, but it must be remembered that these figures refer to passages past one fixed spot, and that there was no means of knowing the depth of the movement inland behind the dunes. The high percentage of *Aglais urticae* is particularly interesting. Dr. E. B. Ford in his "Butterflies" (New Naturalist series) says: "The Small Tortoiseshell is not often seen to migrate."

B.S.T.	1.30 -45	1.45 -2	2 -2.15	2.15 -30	2.30 -45	2.45 -3	Total
V. atalanta	2	2	2	1	3	1	11
V. cardui	2			2	1		5
C. croceus	1		1	1			3
A. urticae	13	5	11	4	3	3	39
	18	7	14	8	7	4	58

In addition to the above, *Pieris brassicae* and *Pieris rapae* were passing in the same stream in large numbers. No count was made of them, but there were certainly as many as all the others put together. Two unidentified Dragon-flies were also noticed flying in the same direction and over the same ground.

H. B. SARGENT (1189).

REVIEWS

Handbooks for the Identification of British Insects, Coleoptera, Cerambycidae by E. A. J. Duffy. Published by the Royal Entomological Society of London, 1952. Pp. 18. Price, 3/6.

As with the other books in this series, this slim volume contains diagnostic tables of the insects under consideration, including those so frequently introduced by commerce, with hints as to their probable host-plants. These tables are founded on those of Fowler and Reitter, and are based to a large extent on characters of the upper side; there are three valuable plates illustrating structural characters. The tables are easy to use and will prove most valuable to even the more advanced collectors of British beetles. As usual with the series, the printing and illustrations are excellent. It can be thoroughly recommended.

G. B. W.

Handbooks for the Identification of British Insects. Hymenoptera: 2. Symphyta, section (b). By R. B. Benson. Published by the Royal Entomological Society of London, 1952. Pp. 86. Price, 15/-.

Section (a) of this work was reviewed in the *Bulletin*, Vol. **11**, p. 92, This is a continuation of that book and follows the same method in describing these insects. It contains 213 line drawings and deals with the family Tenthredinidae. Two more parts of this work have to be published and then we shall have an authoritative work on the identification of our British Sawflies.

E. E. S.

Printed by T. Buncle & Co. Ltd., Arbroath, and published by the Amateur Entomologists' Society, 1 West Ham Lane, London, E.15. 1953.

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EDITED by W. J. B. CROTCH, M.A., A.K.C.

AES BULLETIN

No. 147

MARCH 1953

COLLECTING COLLEMBOLA (1)

(The AES Council is indebted to Mr. Peter R. Barratt, F.R.E.S., for the specially-written series which begins below).

What are Collembola?

The name Collembola is derived from two Greek words *kolla* (meaning Glue) and *embolon* (meaning a peg). These two words refer to the extensile ventral tube. These insects are very small and are elongated or almost globular in shape; the exoskeleton, which may be of almost any colour, metallic or otherwise (colours are very deceptive, and should not be relied upon as an aid to determination) and either smooth or granular, bears either scales, hairs, rods or sometimes pseudocelli.

The eyes normally consist of a group of eight or fewer ocelli on each side of the head; but some species have no eyes at all. The antennae are almost always four-segmented, although some rarities may have as many as five or six.

Special sense organs are to be found in certain species on segments iii and iv and in some species there are post-antennal sense organs consisting of various complex structures. These are all the subject of a good deal of controversy. The mouth parts, consisting of mandibles, maxillae and greatly reduced labium, are for chewing or sucking and are withdrawn into the head. They are of very little use in determination, because when the insect is mounted on the slide for such purposes, they are difficult to show to the best advantage.

The Collembola are of very special interest because the usual method of respiration is through the cuticle. Tracheae are present in several genera of the Symphypleona; these have a single pair of spiracles between head and thorax. The thorax is divided into three segments which are sometimes merged or indistinct; the legs consist of a coxa, trochanter, femur and tibiotarsus with a pair of claws referred to as unguis and unguiculus; these last may in certain species be absent.

The abdomen consists of four segments which again may be well defined or indistinct; on the first abdominal segment is the extensile ventral tube or adhesive organ. Underneath segment iii there is a spring holder or retinaculum, which holds in place the furcula, a partly fused organ on segment iv or v which is used for jumping; hence the common name Springtail.

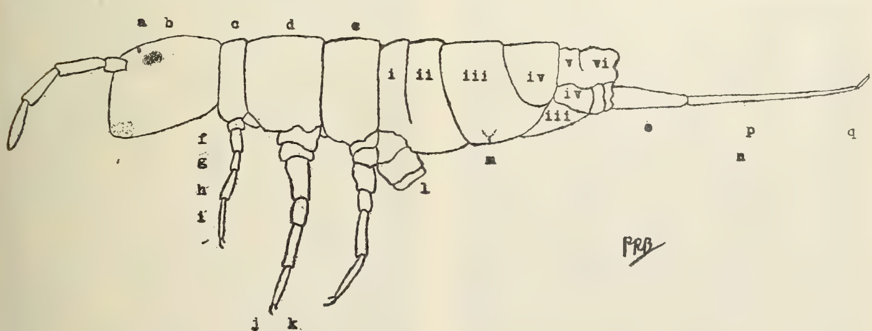

Fig. 1. A typical Arthropleonid

(a) Postantennal organ. (b) Eye patch. (c) Prothorax. (d) Mesothorax. (e) Metathorax. (f) Coxa. (g) Trochanter. (h) Femur. (i) Tibiotarsus. (j) Unguis. (k) Unguiculus. (l) Ventral tube. (m) Retinaculum. (n) Furcula. (o) Manubrium. (p) Dentes. (q) Mucro.

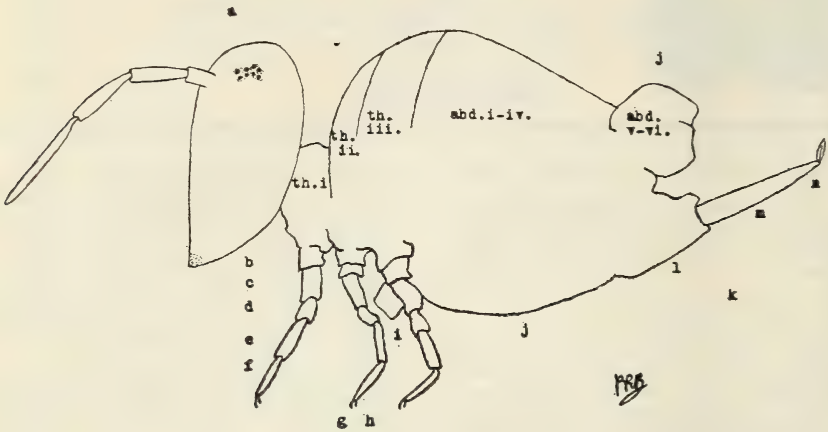

Fig. 2. A typical Symphypleonid

(a) Eye patch. (b) Praecoxa. (c) Coxa. (d) Trochanter. (e) Femur. (f) Tibiotarsus. (g) Unguis. (h) Unguiculus. (i) Ventral tube. (j) Fused abdominal segments. (k) Furcula. (l) Manubrium. (m) Dens. (n) Mucro.

These insects have no genitalia, both sexes being similar. The nearest thing to genitalia is an opening on segment v. The anus is on the underside of the sixth segment.

Where are they Found?

Most species inhabit moist or dank surroundings, and live for the most part amongst decaying vegetable matter, mosses and fungi. They may occur anywhere where there is sufficient moisture, for example, under stones, in leaf mould and, sometimes, deep in the soil.

Why Study Them?

The Collembola are amongst the least studied groups of British insects, partly because the difficulties of mounting and preservation have been far from overcome. These obstacles should, however, be more than a deterrent to their study; they should be taken as a challenge for those with time, patience and a desire to explore a little known realm of British Entomology, which, nevertheless, provides unlimited scope. I must at this stage point out that lack of information can be a big hindrance and can quite easily add to the chaos at present reigning in the Order. It is my hope that these notes will attract the attention of someone who has not yet selected a particular group for study, or someone who feels that he can add little of real value to the present knowledge of a well-studied subject, and encourage him to enter on a worth-while venture. As the Collembola are minute insects ranging from a few millimetres to considerably less than a millimetre when fully grown, a microscope is an absolute necessity; after that there are no holds barred.

Apparatus

The collecting of Collembola is a simple matter, and very few items of equipment are needed. The first and most essential item is the Aspirator, or Pooter, as it is commonly known*. This may be used for collecting the specimens from the undersides of stones or off plants. Great care should be taken to avoid damaging the insects by misuse. The second requirement is a small brush, preferably camel-hair. This dipped in spirit is handy for obtaining awkward specimens. Thirdly, a net of reasonably fine gauge. I myself use one made from 60 pic. voile, because some of the insects are so minute that they may easily pass through the average netting material. Fourthly, a few replacement tubes for the pooter, which should contain 90% alcohol. It should be noted here that the insects

* An excellent pooter is described and figured in *AES Leaflet* No. 6.

sucked into the pooter can be immersed from one of the spare tubes containing alcohol and, the tubes being the same size, the empty one be substituted, so providing a clear pooter for further collecting. The tubes should always be kept as full as possible so as to avoid damaging the insects whilst in transit. The best form of label is a piece of plain paper upon which the data are written in pencil. The tubes can now be kept indefinitely, with the label *inside*, if placed in another receptacle and covered with alcohol to prevent evaporation from the tube. The graphite from the pencil is unaffected by the alcohol, and can be easily read after drying. A fifth item for obtaining specimens is the Berlese funnel, which is an inverted conical water bath with an aperture at the bottom and a sufficient diameter at the top to enable a tray or trays with perforations of a definite diameter containing soil or humus to be placed there (fig. 3). This is heated by a gas ring underneath to raise the temperature of the funnel to 120° F., at which heat it should be possible, within 24 hours, to drive all the insects out of the trays down the funnel into a glass container underneath containing alcohol. In practice, I have found that a temperature of about 100° F., applied for a slightly longer period, gives better results, due to the fact that the sample does not dry out too quickly, and more insects

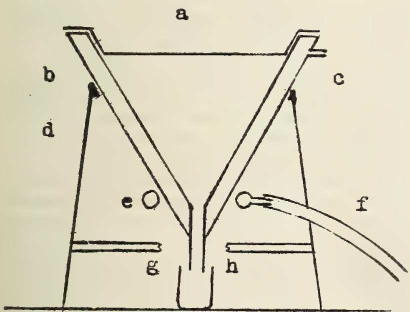

Fig. 3. The Berlese Funnel

(a) Tray pierced with holes of required diameter. (b) Conical water bath. (c) Filling cap for water and safety valve combined. (d) Wrought iron stand. (e) Gas ring. (f) Gas supply tube. (g) Tube through point of cone. (h) A receptacle containing spirit.

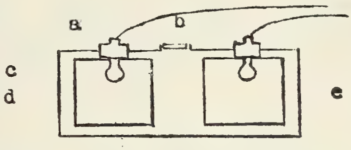

Fig. 4. Tullgren's modification (for Berlese Funnel)

(a) Bulb holder. (b) Observation panel. (c) Gauze on side to help escape of hot air without lowering of temperature. (d) (e) Sides made of any suitable material.

are thus trapped. A method which I have found to be useful is Tullgren's modification of the funnel (fig. 4), where you have the additional feature of heat applied from above by 15 watt bulbs, which can be used either alone or in conjunction with the gas ring.

Methods of Preservation and Mounting Size

I have already mentioned the best medium for preservation, namely, 90% alcohol; methyl, ethyl or isopropyl may also be used. The latter does not seem to be quite so harsh on the specimens, but it must be at a concentration of at least 85%, or the hairs or scales on the insects will cause them to float on the surface. Some authorities recommend the keeping of some specimens in alcohol permanently, with a few of the batch mounted on slides; others prefer slide mounting only. I am not prepared to condemn the former, although I personally almost always use only the latter. There are good arguments for both systems.

The accepted method of mounting Collembola to-day is in Berlese's fluid. This is done by transferring the specimens from the alcohol to water or acetic acid before placing in the Berlese on the slide. After arranging the specimens as required, put on the cover slip and leave to dry in a dust-proof receptacle for about two weeks. If placed near warmth they will harden a little more quickly, but even after this time has elapsed great care should be taken when handling the slides, because a damp atmosphere may make the exposed mountant tacky. If crystallization takes place, run acetic acid round the cover slips and heat slightly; if necessary to re-

mount the slides, the mountant can be dissolved in water. This method of mounting has the advantage over balsam in that the mountant has a relatively low refractive index and, therefore, permits greater resolution of fine details.

An alternative method is to mount the specimens direct from alcohol (ethyl) into polyvinyl alcohol. I have used Dr. Salmon's type A1. formula with some success.

It should be noted that, if staining is required, acid-fast stains should be used in both cases, and that both mounting media clear Collembola specimens without the necessity for a clearing agent. If the specimens are very opaque, they can be cleared in Berlese before mounting. Caustic potash can also be used, but there is a slight tendency for scales and hairs as well as other features to come off.

(To be continued)

PECULIARITIES OF LYMANTRIID LARVAE

I was particularly glad to see J. C. Midlen's note on *L. dispar* in the November *Bulletin* (**11**, 103) because I have for some time been interested in the abdominal glands in Lymantriid larvae to which he refers, and had been on the point of writing to ask whether any of our members could give me certain information about them in the English species.

The following remarks refer exclusively to those glands on segments Abd. 6 and 7 (9th and 10th segments of Midlen's note). They are present in almost all—probably in all—Lymantriids that I have bred in Kenya: though *Dasychira georgiana* has only one—on Abd. 7— as is also the case, I believe, in another species of the same genus from India, *D. grotei*. The colour and shape of the glands differ in different species; in some they are most conspicuous, while in others they are very difficult to detect. Perhaps the most usual shape is that of an ordinary wooden draughtsman; i.e., a very short cylinder showing one or more concentric rings on its flat top. Others are shaped like an Indian club; others, again, have a slim neck with a sort of bell-mouth at the top. All, to the best of my knowledge, can be everted at will, either one at a time or both together; and in two cases (*Pteredoa monosticta* and *Polymona rufifemur*) I have noticed a bead of fluid at the upper end of the everted gland. In *rufifemur* I found that eversion of the gland and extrusion of the fluid could be induced by tickling the anal segment with a brush: and if the bead of fluid was removed, the gland was retracted and everted again with a fresh bead. This larva is rather inclined to the processionary habit: and I have seen the erection of the gland occur in response to nudging by the larva next in the queue.

I have tried to discover whether the fluid is attractive to ants (as with Aphides and some Lycaenidae) or whether it is perhaps repellent to parasites or carnivorous ants. But, so far, I have insufficient data for any conclusion on these points.

I should be most grateful if any member could give me the following information about these particular glands—those on Segs. A 6 and 7 only—in the larvae of British Lymantriidae:—

(a) Name of species.
(b) Whether one, or two glands are present: *or none*.
(c) Whether fluid, either as spray or bead, has been observed.
(d) Any other relevant information.

In conclusion, I should like to congratulate Midlen on his acute observation and detailed description. He may be interested to note that in South's "Moths of the British Isles," these glands on the larva of *Eup. chrysorrhoea* are referred to as "vermillion spots." As Midlen has observed, they are much more than that.

A. L. H. Townsend (1691).

PLASTIC CONTAINERS AS REARING CAGES

For the first time, I have been using as rearing cages for young larvae the plastic sandwich cases obtainable at well-known multiple stores.

They have all the advantages of the normal glass-topped boxes, and a few more besides. They are wholly transparent, do not rust, and are not stained by frass, as I have found the tins to be. They are easily washed in water and easy to dry, and, most important of all, keep the food-plant fresh for a long period. They are reasonably cheap, and I would heartily recommend them to members.

C. J. Taylor (2055).

These containers have been "discovered" by a number of members known personally to the Editor, who uses them himself. We undoubtedly ought to have forestalled Mr. Taylor in his thoughtfulness for the membership in general. Two further points

are: that they can be used for larger larvae than glass-topped tins can accommodate; and they can be drilled very easily for ventilation, if required. —ED.]

•

COLEOPTERISTS, TAKE CARE!

According to Reuter, an East German court has granted a divorce to a Coleopterist, whose wife put beetles in his soup because he seemed to prefer them to her. "Now," she said, "he can be married to his beetles."

•

THE CHANGING SCENE (2)

(*Continued from p. 13*)

It sometimes happens that a change in the insect population occurs gradually over a long period of time; sometimes the change is rapid, a considerable alteration occurring in a matter of a year or two, as in the case of *Euphydryas aurinia* Rott. (the Marsh Fritillary) in Cumberland, of which I gave an account last month. Sometimes, however, a remarkable change occurs within the same season; and something of that sort happened here in Westmorland last year (1952). It appears that at the beginning of the season naturalists were of the impression that it was likely to be an exciting year; immigrants, some of them rare, were seen in good numbers at remarkably early dates. Though these immigrants failed to spread as far as Westmorland, the resident species were extremely plentiful here up to the middle of the summer. Then numbers began to wane and the process continued steadily, so that the autumn species were scarce, and very little was to be seen on the wing by day or night. One wonders whether this was a local situation taking its rise from some undetermined local condition, or whether it was, in fact, widespread. If so, are any theories forthcoming to suggest an explanation? One suspects that climate must have something to do with it; here, after a warm and fine spring the weather was thereafter rather cool, with less than the average sunshine, but also less than the average rain. There were no heat-waves, except during the fine spring in mid-May, but there was no weather obviously severe enough to have a deleterious effect on the insect population. Nevertheless, the change was most noticeable and is best illustrated by giving two lists of counts at the M.V. trap, one in April and the other in September. Neither night selected was the best nor the worst during the month in question, and, in point of fact, the counts here recorded can be taken as roughly average.

APRIL 15th, 1952

Light E. wind, increasing to fresh during night. Rather warm, with variable cloud.

Cerastis rubricosa Fabr. (Red Chestnut)	18
Orthosia gothica Linn. (Hebrew Character)	57
,, *cruda* Treits. (Small Quaker)	20
,, *stabilis* View. (Common Quaker)	65
,, *miniosa* Fabr. (Blossom Underwing)	1
,, *incerta* Hufn. (Clouded Drab)	73
,, *munda* Esp. (Twin-spot Quaker)	7
,, *gracilis* Fabr. (Powdered Quaker)	1
Xylocampa areola Esp. (Early Grey)	10
Xylena ensoleta Linn. (Sword Grass)	1
Alsophila aescularia Schiff. (March Moth)	2
Colostygia multistrigaria Haw. (Mottled Grey)	7
Earophila badiata Hübn. (Shoulder Stripe)	10
Coenotephria derivata Borkh. (The Streamer)	2
Selenia bilunaria Esp. (Early Thorn)	4
Biston strataria Hufn. (Oak Beauty)	1
Total,	279

SEPTEMBER 15th, 1952

N.E. wind, mainly light, but somewhat variable in strength; mainly overcast; moderate temperature.

Spilosoma lubricipeda Linn. (White Ermine)*	1
Episema caeruleocephala Linn. (Figure of Eight)	1
Amathes glareosa Esp. (Autumn Rustic)	5
Triphaena pronuba Linn. (Yellow Underwing)	2
Tholera cespitis Fabr. (Hedge Rustic)	1
Luperina testacea Schiff. (Flounced Rustic)	1
Aporophyla nigra Haw. (Black Rustic)	1
Antitype chi Linn. (Grey Chi)	2
Meganephria oxyacanthae Linn. (Green-brindled Crescent)	1
Hydraecia micacea Esp. (Rosy Rustic)	4
Rhizedra lutosa (Hübn.) (Large Wainscot)	1
Amphipyra tragopogonis Linn. (Mouse)	3
Atethmia xerampelina Hübn. (Centre-barred Sallow)	1
Anchoscelis helvola Linn. (Flounced Chestnut)	1
Citrea lutea Stroem (Pink-barred Sallow)	8
Cirrhia icteritia Hufn. (Common Sallow)	1
,, *gilvago* Esp. (Dusky-lemon Sallow)	3
Dysstroma truncata Hufn. (Marbled Carpet)	3
,, *citrata* Linn. (Dark Marbled Carpet)	1
Thera obeliscata Hübn. (Grey Pine Carpet)	4
Total,	45

*A most unusual date.

I emphasise that both these counts were typical of the months in which they occurred. Obviously something happened between these two dates which adversely affected the insect population. What was it?

J. H. Vine Hall (1520).

STRIDULATION OF *CYCHRUS ROSTRATUS* L.

Mr. C. M. Idle in a recent note (*Bulletin*, **11**, 115) commented on the chirping produced by this beetle. The stridulation of *Cychrus rostratus* has attracted the attention of entomologists for more than a century and various views have been held as to how the noise is produced. Gahan (Stridulating Organs in Coleoptera. *Trans. Ent. Soc. London* 1900, 433-452) suggested that the sound was produced by friction between the epimeral lobes of the prothorax and the lateral edge of the mesosternum. According to Fowler (1887, "The Coleoptera of the British Islands **1**, 5), the stridulation is caused by rubbing the abdomen against the elytra. This view is shared by Prochnow (1907/1908 "Die Lautapparate der Insekten." *Int. Ent. Zeitschr.* **1**. 169 and 181) who describes the stridulating apparatus in detail, and a shorter account by the same writer appears in Schröder's *Handb. d. Ent.* 1928, **1**. Prochnow's explanation takes into account the remarkable shape of the elytra which are highly arched and joined at the suture. The hind wings are absent and the elytra cover the flat abdomen, like, as he puts it, an upturned boat. The edges of the elytra slope downwards and are provided with a fairly deep groove (the epipleural groove). Prochnow observed that the chitinized edge of the abdomen fits into this groove in such a manner that it can only move in the direction of the long axis of the body. He states that the stridulating apparatus is situated in this groove and takes the form of a large number of more or less thick chitinous points present along the inner edge and on the floor of the groove, and arranged partly in rows from above downwards. He describes these points as being often widened to small plates and as being sometimes cone-shaped. A corresponding number of pointed or peg-like structures are described on the edge of the abdomen. The noise is said to be produced by the frictions of these parts when the abdominal segments are contracted, and the sound is increased by the hollow elytra which act as a resonator. From this description one would imagine that the stridulating apparatus would be easy to see; but this is far from being the case, and Darwin ("The Descent of Man", Chapter X), after examining *Cychrus* was doubtful whether it possessed any true rasp.

Some years ago I kept a few of these beetles alive for several weeks during the winter and they made a hissing noise on most occasions when the box containing them was opened. The noise appeared to be a first reaction to disturbance and was not kept up if interference was continued. In examining these specimens, I could not detect any obvious rasp, but I think that a possible stridulating surface occurs near the apex of each elytron at the point where the epipleural groove widens on its inner side to fit over the enlarged last pleurite of the abdomen. The surface of the flange so formed is minutely and regularly shagreened, and the intersecting lines are so situated as to give in parts a finely striolated effect, the striolations slanting towards the edge of the flange. If examined in alcohol this shagreened area shows a sheen like velvet. There is a corresponding finely shagreened " velvety " strip on the posterior part of the last abdominal pleurite on its inner side. Some finely shagreened sculpture can also be detected on the anterior part of the epipleural groove, particularly on the inner edge, and it is also present in places on the anterior abdominal pleurites. I think it is possible that interaction of all these surfaces, on movement of the abdomen, may produce the hissing sound. It would be interesting to know if any movement of the abdomen can be detected during stridulation, but at present I have no living beetles to observe.

I have not found any recent account of the stridulation of *Cychrus*. It is not mentioned in G. J. Arrow's interesting paper on the origin of stridulation in beetles (1942 *Proc. R. Ent. Soc. Lond.* (A) **17**; 83-86), but, since writing the above, I have seen T. Marshall's note (" Cause of Sound emitted by *Cychrus rostratus*." *Ent. Mag.* 1833, 213-214) and I am much interested to find that he also attributes the sound to friction of the edges of the abdomen in the epipleural grooves, moreover he considers that it is precisely at the widened part of the groove, which I have described above, that the friction is most pronounced.

He was able to imitate the sound by rubbing the edge of a piece of stiff paper in the channel. This I have attempted but without success! There is certainly scope here for further investigation and I hope this brief outline of the facts recorded will stimulate observations.

DOROTHY J. JACKSON (1124).

Mr. H. K. Airy Shaw (545) remarks that the unfortunate results of over-curiosity on the subject of the stridulation of *Cychrus* are detailed by C. C. Townsend, 1944, *Ent. Mon. Mag.*, **80**, 213. See also comment, *loc., cit.*, 293.

PENDULOUS FOOD-PLANTS

Many of the most popular larval food-plants in Kenya are trees with pendulous branches; and when feeding young larvae on their foliage in the ordinary way—that is, on a twig or two standing in a water-bottle—I have encountered the following difficulty. When in search of fresh food, the larvae walk *upwards*, expecting to find the twig they are leaving joined to another, *down* which they can go to find new pasture. Instead of this, they find themselves at the end of the upright twig; and often take a very long time to make up their minds to go *down* their twig (towards the bottle) where they can find a new route upwards. Often, indeed, they find themselves marooned on the lid of the jar, and are completely at a loss.

I, therefore, bored a hole in the lid of the jar, inserted a long-stemmed branch of the food through it from below, bent the stem over and put its end in the water-bottle, which is

fastened by a rubber band *outside* the jar. Thus the food-plant was, so to speak, standing on its head (its natural position), and the larvae had no further difficulty. I now employ this method in all my cages where this type of plant is used, and find it most successful. The hole in the lid is, of course, plugged with wool round the stem, and must be large enough for a fresh branch to be put in beside the old one when necessary—a most simple method of food-changing. The business of renewing the water is also much simplified. The figure shows the set-up with a cylinder cage. Later I developed the idea, with even better results, to my breeding cages proper. With several holes cut in the top and a corresponding number of bottles outside, the ease of food-changing and cleaning is remarkable.

A. L. H. TOWNSEND (1691).

THE WHITE ADMIRAL BUTTERFLY

Near Lapford on the main Exeter-Barnstaple road is a fairly large oak wood on hilly ground, facing south, mainly comprised of mature trees, and in places thickly populated with oak and birch saplings.

I visited this wood on July 3rd, last year, and although on that day the temperature was below normal and the sky overcast, I was surprised to see three males flying. I took one specimen which was quite fresh, although small and of normal marking. I paid a further visit on July 10th, and the weather on that day was bright and warm. During the afternoon and evening, a thorough tour of the woods was made, and *L. camilla* was in abundance everywhere. On yet another visit on August 14th, tattered specimens were still observed flying until late in the evening. During this visit I found quite a number of ova, and on one leaf of honeysuckle there were no less than three.

There is no doubt that *L. camilla* is well established in this part of North Devon and I would be interested to know if this species has spread to other parts of North Devon.

L. J. BACKWELL (2070).

[The Editor has just received a copy of "The Lepidoptera of Devon: Introduction and Part I," by S. T. Stidston, F.R.E.S., from the Devonshire Association, Entomological Section. The entry about *L. camilla* states that "this formerly very rare species appears to have established

itself in three or four districts, and is very slowly spreading westwards, having reached the Newton Abbot district."

This first part on the Lepidoptera covers the macros, and Captain Stidston (40) is starting on Part II, the micros. He would be grateful for any Devonshire records, common as well as rare, with close locality and dates.

The List is a scholarly piece of work, very clearly produced. Non-members of the Devonshire Association may obtain copies from Captain Stidston at the nominal price of 5/3 (post free).

NOMENCLATURAL ERRORS

Col. J. C. Fraser (890) kindly points out the following errors in the list of overseas exhibits given on pp. 3-4:—*Vanessa gonerilla* (the New Zealand Red Admiral) should be *Pyrameis gonerilla*. *Danaida chrysippus* should be *Danaus chrysippus*. *Hypolinnos misippus* should be *Hyplimnas misippus*.

Mr. S. E. Allen (2001) writes to express his apologies for the following misidentifications in his list of rarities from Woolmer Bog (p. 6):—*Acupalpus elegans* was, in fact, *Acupalpus dorsalis* and *Acilius canaliculatis* was *Acilius sulcatus* var. *scoticus*.

REVIEWS

Linger and Look, by L. H. Newman. Pp. 199, 40 half-tone plates. Staples Press, London, 1952. Price 11/6.

In a way, this is the " mixture as before ", and a most pleasant mixture it is—beautiful photographs with interesting and informative letterpress. The scope is a little wider and extends beyond the Lepidoptera to whelks and gall wasps; but a naturalist's interests should not be limited too narrowly.

The author acknowledges photographs by eight photographers, but individual pictures are without ascription. The diversity of sources probably explains the considerable variation in scale, which is very misleading in some juxtapositions.

The scientific reader may well complain that there is nothing to show the actual size of the insect or animal pictured. There is, also, unfortunately a technical error on page 125, where the thoracic legs are wrongly defined as " pro-legs."

Nevertheless, there is much good and sound talk in the book, written in an easy style. Parents will find this a useful birthday present for the youngster with natural history leanings and will not disdain to have a good look at it themselves. T. T.

The Young Field Naturalist's Guide, by Maxwell Knight, O.B.E. Pp. 144 and supplement of photographs. G. Bell & Sons, 1952. Price 10/6.

This is an admirable book which deals in the most practical way with methods of studying living nature and making records. It even includes instruction on the making of plaster-casts of animal and bird foot-prints. It is, indeed, a young nature-sleuth's *vade mecum*. The book list is deliberately short, but it contains the titles of the few essential ones for each major division of Nature study. We are proud to note that the AES Publication " Practical Methods and Hints for Lepidopterists " is included and described as " a mass of practical information for butterfly and moth collectors."

There is an unfortunate error on p. 72, which should be corrected in the subsequent editions which will undoubtedly be required. It is stated that " to reduce your 40 per cent. formalin solution to 10 per cent., you add to one part of formalin nine parts of water; for 5 per cent. . . . add nineteen parts." Simple arithmetic will reveal the resulting percentages to be 4 and 2 respectively.

W. J. B. C.

Professor Fungus **By G. S. Kloet**

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THE BULLETIN OF THE AMATEUR ENTOMOLOGISTS' SOCIETY

EDITED by W. J. B. CROTCH, M.A., A.K.C.

AES NOTICE

WHERE TO WRITE

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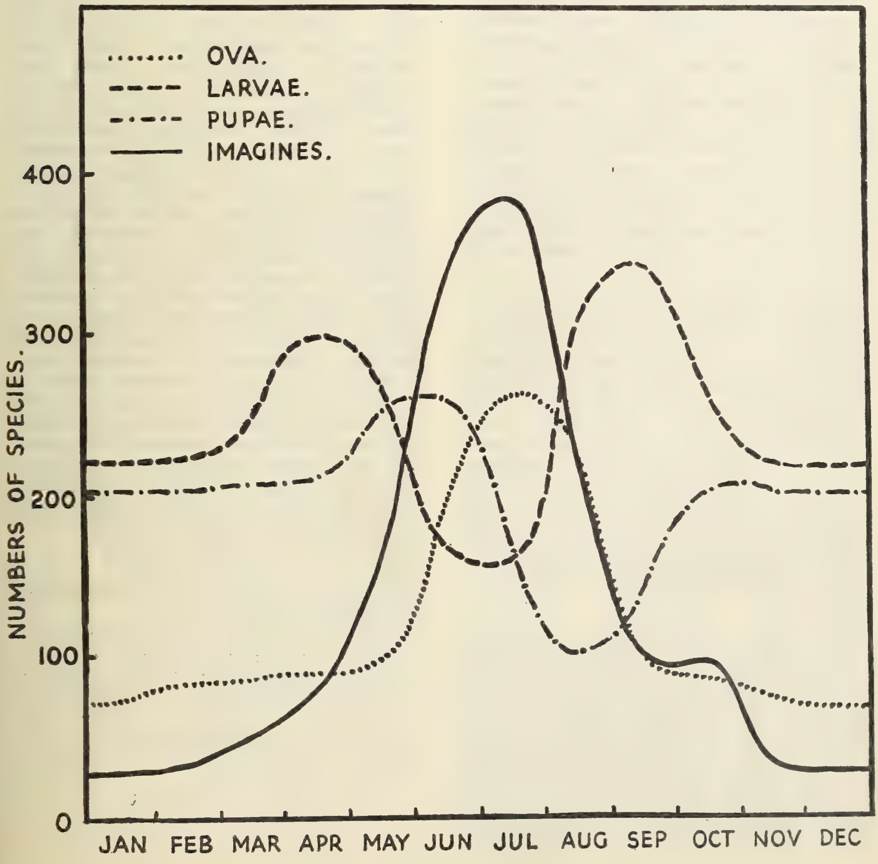
AES BULLETIN No. 148 APRIL 1953

A CONSPECTUS OF LIFE CYCLES OF BRITISH MACROLEPIDOPTERA

(*Dr. Bryan P. Beirne has prepared for the* AES *the following diagram and note which will be of interest to members.*)

The diagram below shows the numbers of species of British Macrolepidoptera in each stage of the life-cycle in each month of the year. It does not prove anything that is not generally known. There are several points of interest, however. More than 200 species are in the larval stage every month, except in June and early July, when the number drops to about 100. But at the end of April and in September larvae of over 300 species can be found. Over 200 species pass the winter as pupae. In June about 250 are in the pupal stage, but by August the number has dropped to about 100. The number of species in the adult stage is very small in winter, but increases sharply in May and June to a peak of about 400—or nearly half the total—at the end of the latter month. This is followed by a rapid decrease, broken by a halt in September caused, in part, by the appearance of second broods.

There are opportunities for good hunting all the year round!



CLIMATIC VARIATION AND THE DISTRIBUTION OF INSECTS

It is surprising to me that the significance of climate variation as a factor affecting the distribution of Lepidoptera and other insects does not appear to have been sufficiently stressed by the majority of writers dealing with ecological matters generally, and extension of range more particularly. In this fascinating phenomenon of climatic change may lie the answers to many problems of distribution the solution of which has so far eluded us, either wholly or in part. A vast field of ecological-phenological research awaits investigation, and in this work the amateur entomologist can play a by no means unimportant, if not indispensable part.

True, Ford[1] invites attention to the point that changes in distribution of certain butterflies are almost certainly "at least partly dependent upon climatic effects," and also comments on "several remarkable instances . . . in which unidentified climatic factors apparently exert a notable control upon both the fauna and flora of vast territories . . ." But is it not a somewhat disconcerting thought that many an amateur naturalist seems inclined to attempt to run before he can walk: if you like, to read the right things in the wrong order, likewise to tackle special or at any rate complex matters before he has mastered, more or less, the simple but essential elements of nature study?

My own approach to the study of nature has always been profoundly influenced by the conviction that, primarily, the biological approach should be a two-fold one, embracing the phenological and the ecological "angles," which, patently, are naturally linked. Yet, although much of the admirable and ever-increasing literature available to the novice student deals faithfully enough with the broad ecological aspect, it largely ignores, or deals all too superficially or haphazardly with, the equally important and inseparable phenological one.

Whenever opportunity presents itself, whether in writings, lectures, correspondence or conversation, I make a point of emphasising, especially for the benefit of beginners, the importance of weather and climate (which latter may be defined, in brief, as "average weather") as study-subjects in themselves, no less than as highly significant factors playing a decisive part in determining the distribution, phases, activities and modifications of animals, including insects. The tyro could do worse than read and thoughtfully digest such useful and illuminatng books as the late Sir J. Arthur Thomson's "The Biology of the Seasons" (1911) (perhaps rather out-dated, but none-the-less fundamentally authoritative), and H. C. Gunton's more briskly modern and well-illustrated "Nature Study Above and Below the Surface" (1938). The latter is certainly one of the best introductions to the study of phenology that any novice could wish to lay hands on, though for some odd reason it seems nothing like so accessible as was the case a few years ago.

Preferably in conjunction with such readings, or at any rate at an early stage in study, resort to up-to-date works on weather and climate is, I suggest, most desirable; and of these helpful contributions two, in particular, by Brooks[2] and Kimble[3] respectively, are recommended. Not only are they very readable; but also, between them, they sum up much useful information concerning climatic fluctuation in "historical" times and probable trends in the near future. It is significant that they agree, in broad outlines, in posing the thesis that the world is gradually warming up, and that this interesting change—at least in the Northern Hemisphere—affects chiefly the winters, so far as the British Isles are concerned; one notable tendency being a steady increase in mean winter temperatures. Such a theory can hardly be ignored, least of all by naturalists interested in the distribution and habitats of animal groups or faunas, for instance Lepidoptera in our own islands—which, it must be remembered, constitute the northernmost limits of the geographical range of certain species. The position is, however, becoming increasingly fluid and reveals a strong tendency for those limits to expand steadily, and by no means slowly, Polewards.

REFERENCES.

1. E. B. Ford, *Butterflies* (New Naturalist, 1945), pp. 140-1.
2. C. E. P. Brooks, *Climate Through the Ages* (rev. edn., 1949).
3. G. H. T. Kimble, *The Weather* (Pelican, rev. & enl. edn., 1951).

PETER MICHAEL (748).

LETTER TO THE EDITOR

Dear Sir,—May I beg a few lines in the *Bulletin* in order to try to ascertain the position of Thomas Gray, the scholar and poet, amongst the pioneers of our hobby?

Recently I acquired an 1814 edition of the works of Gray. At the beginning of the book there is a brief biography of the poet by the Rev. John Mitford. In this is a reference to Gray. Apart from being a keen student of Linnaeus he is credited with an account of English insects "more perfect than any that had then appeared."

The above account is the first that I have come across in which Gray has been reported as being interested in entomology. As Gray died in 1771, I should think that he would have been a few years in advance of Moses Harris, who is generally reputed to be the earliest accurate entomologist.

Has any AES member any knowledge of his entomological works, and if so what bearing have they had on the subject through the years?

Yours faithfully,

J. B. Ogden (1580).

COLLECTING COLLEMBOLA (2)

(*Continued from p. 20.*)

The Life Cycle

I feel that I ought to point out that very little is known of the life-history of any species of Collembola, with the notable exceptions of *Smynthurus viridis* Linnaeus 1758, the Lucerne flea, and the garden springtail, *Bourletiella hortensis* Fitch 1863, which though partly known is still wanting in certain details. There is much work to be done in this field.

The egg when laid is of a semi-fluid nature. Ova are usually laid in small groups on the ground or the particular plant or fungus on which the adult is feeding. The exterior, which soon hardens and assumes a smooth spherical shape, is invariably creamy-white in colour. In the case of the Lucerne flea, the female ingests soil and excretes it over the eggs, thus providing a protection against enemies and dry weather.

When newly emerged the young Collembola are almost the same in appearance as the adult, except for the absence or deficiency of colour and difference in size. The Collembola undergo no metamorphosis; but they pass through a number of instars, separated by ecdyses, i.e., stages when the insect, in order to enlarge, is obliged to cast its skin. This method of growth must be kept in mind, to avoid any confusion due to size when trying to determine your specimens. Apart from this, there is sometimes considerable variation of colour and of markings between different instars of the same species; these characteristics are, therefore, of subsidiary value as a means of identification until more is known about life-histories—particularly of the genus *Orchesella*.

So far as can be ascertained at the moment, the optimum temperature for egg laying lies somewhere between 50° and 80° F. in the United Kingdom. The optimum for Collembola which inhabit such places as South Victoria Land must, however, be far below this range. Here, again, there is wide scope for study.

Habitat and Food

Collembola can live in the sub-arctic and antarctic regions, the tropics of Africa, the wastes of Australia, at the tops of the highest hills and mountains, in the deepest caves—in fact, *anywhere where there is sufficient moisture to permit the growth of vegetation*. A few species which possess scales are to be found in relatively dry places; the majority inhabit the soil, living on decaying humus, the roots of plants, bulbs, the foliage of young plants, the pollen of conifers, the spores of fungi and algae, the sap exuding from trees or the mycelium of fungi. They are also found upon the surface of waters—notably *Hydropodura aquatica* Linnaeus 1758. I have found another species (*Agrenia bidenticulata* Tullberg 1876) in a moorland stream in Yorkshire. They were alighting on the water from the moss round the bottom of stones in a fast running stream, letting themselves be carried an inch or two down stream, then jumping back on to the stone and moss only to repeat the performance. Seeing several thousand of these purple coloured insects doing this at the same time was a lucky observation, for it is apparently an unusual phenomenon, for which no explanation has as yet been put forward. Another unusual species worthy of mention is *Anurida maritima* Laboulbène 1865. It is a pale blue, knobbly and cherubic springtail to be found round the coasts of the British Isles. The insects live between the high and low tide marks, where they feed on the remains of dead molluscs, worms

and other decaying matter. So far, they have not been found above the high water mark: by this, we may infer that they must at times be covered by several feet of sea water. Careful records would be of scientific value here. It would be interesting also to know whether the beetle *Aëpopsis robinii* Laboulbène 1849 which lives at about the half tide mark is a predator upon them.

Two other interesting habitats well worth examining for unusual species are the nests of Ants and Termites. It has often been assumed that Collembola are soil insects; but an examination of the vertical fauna of woodland areas might prove interesting. Another British species which has attracted little attention is *Hypogastrura nivicola* Fitch 1847, known as the Snow Flea because of its being found hopping about on the snow in early spring during thaws. This species finds itself at home amongst our traditional English slush: in the near-arctic regions of North Canada it is known to be a great source of inconvenience to the harvesters of maple syrup, although very few records are available of its activities.

Methods of Distribution

How these insects increase their distribution is a subject where a great deal of theory is supported by a small amount of fact. One obvious method of distribution is in the transfer by many natural means of either soil or plants from one place to another. Some have suggested that dispersal is by means of water, since the insects are light enough to be supported by the surface tension or they may be borne on plants washed away during floods, and often carried considerable distances. Some may be blown by the wind, as has been noted by Freeman (1952): in the United States of America they have been collected at 11,000 feet by sticky traps on aircraft; whilst in England they have been caught in nets suspended from wireless masts in Lincolnshire at 277 feet. Others may be carried on the bodies of birds (Haarlov, 1942). I am at present examining part of the Harry Britten Collection from the Manchester Museum, University of Manchester, which contains many specimens taken from birds' nests. My findings and conclusions will, however, be published elsewhere at a later date.

(To be concluded)

Peter R. Barratt.

ANTENNA-BRUSH?

Mr. D. P. Heppell (1690) has submitted to the Microscopy group an interesting photograph from a slide he has made of the tibia of a foreleg of the moth *Plusia gamma.* The accompanying diagram has been drawn from the photograph, which appears to be about twenty-five times magnified. He describes the "curiously articulated appendage resembling a brush." It is his guess "that it is an apparatus for cleaning the antennae." It occurs in both sexes.

Have any members noticed this in other members of the genus? And can they throw any further light on the subject?

Appendage to tibia of foreleg of *P. gamma.* Circa × 25.

LARVAL FOOD RANGE AND POSSIBLE EFFECTS (1)

In response to Dr. Hamill's posing of problems (*Bulletin* **11**, 91), several members write giving details of some of their observations about larval food-plants and colouration (*Bulletin* **11**, 105-07).

From these contributions arise several further questions, namely:—

(i) What is the relation between larvae and their food-plants? (ii) What effect has the food-plant upon the larvae? (iii) What effect has the food-plant upon the adult?

These problems have been dealt with by several observers. It is, however, impossible to give a detailed account of them in a short space and, indeed, few species of insects have been studied. Many more experiments on a large number of species are required and this is where all AES members can help.

Many simple experiments can be carried out, and from their results it will be possible to build up a mass of information, upon which more scientific work can be planned and from which theories may be evolved. *It must be remembered that experiments which give apparently no answer to the questions must be included*, as an unbalanced result would occur if they were left out.

Before giving details of suggested experiments, I think it necessary to consider the questions and their related problems. In a short article it is impossible to go into details; more information will be found in some of the books mentioned in the foot-notes.

Firstly, we have to deal with larval food-plants. In reply to one of Dr. Hamill's questions, Captain Dannreuther mentioned that the range of food-plants on which the larvae of the five white butterflies feed lies between No. 89 and No. 175 in "The London Catalogue of British Plants," 1925. The larvae feed on only 30% of these species of plants. Why should they not feed on the other 70%? 15% of this total are rare or uncommon plants, unlikely to be visited by the butterflies, and a further 5% produce early spring leaves which die by early summer, e.g., Whitlow Grass (*Erophila* (*Draba*) *verna*). This still leaves us with 50%. Of these the majority have hairy, hispid, tough and often small leaves. Of the 30% on which the Whites feed, very few have hairy leaves. Dr. O. W. Richards[1] mentions that probably more larvae would feed on turnips with smooth leaves than hairy leaves. This may often be observed in our own gardens.

From this, and also by looking through P. B. M. Allan's[2] book, it will be observed that the majority of larvae feed on non-hispid plants. There are exceptions; for example the larvae of the Painted Lady (*Vanessa cardui*) feeds on thistles (*Cirsium* spp.); and the larvae of the Red Admiral (*V. atalanta*), Small Tortoiseshell (*Aglais urticae*) and Peacock (*Nymphalis io*) feed on Nettles (*Urtica* spp.). Generally it may be said that the texture of the food restricts the range of food-plants eaten by larvae.

Next we come to a far more important subject, namely, the physiological aspect. An imago lays her eggs on a certain species of plant; the larvae hatching feed on the plant and in doing so get accustomed to its texture and flavour. They will probably remain on the plant for several days at least. Some larvae which are small when fully grown may never leave it. If a larva moves from the plant of the maternal choice, or, in the case of a tree, from that twig, there will be a strong possibility of its finding another plant of the same species. If not, and it starts feeding on another species of plant, it will at once react to a new texture and flavour. If the larva belongs to a non-specialized species, there is a good possibility of its continuing to feed, especially if the plant belongs to the same genus as the previous one. For example, the Elephant Hawk (*Deilephila elpenor*) will feed on most, if not all, species of willow-herb (*Epilobium* spp.) or even other species of the same family. The chemical constitutions of other families are often very different; therefore, relatively few species may be expected to feed on plants belonging to different families. If the larva belongs to a specialized species, then it has to hunt for the right species of plant before feeding again.

These facts will, no doubt, have been noticed by all readers. They are, however, generalizations. It should be noted that markedly non-specialized species, e.g., the Magpie (*Abraxas grossulariata*), Early Thorn (*Selenia bilunaria*) and Garden Tiger (*Arctia caja*) tend to have a great variation in their wing-colouration. Specialized moths, e.g., Pretty Chalk Carpet (*Melanthia procellata*) and the Small Emerald (*Hemistola chrysoprasaria*) have fixed wing colouration: their larvae will feed on only *one* species of plant.

In my opinion the non-specialized species are in the process of evolution and may form new species. The specialized species have come to the end of an evolutionary series and risk the possibility of becoming extinct if their food-plant decreases or becomes

1 *Journal of Animal Ecology*: **9** (1940), 243-288.

2 "Larval Food-plants," Watkins and Doncaster, London, 1949.

extinct, and this frequently happens in the course of man's alterations to environment. The specialized species often have a restricted distribution, limited by the distribution of the food-plant.

(*To be continued*)

J. P. Savidge (2041).

[*There is an error in the address given for Mr. Savidge in the Membership List: for "Spidal" read "Spital."*—Ed.]

THE NEW FOREST

During recent years the New Forest has acquired quite a bad name from the collector's point of view. Many have been disappointed and have returned from their holidays with little to show for their efforts and undoubtedly some unkind remarks have been made which have been passed on to other collectors.

Having lived in the New Forest all my life, I think I can help by trying to show the cause of the change in recent years from the "glorious" years before the war. I will commence by giving a picture of the years immediately before the 1939-45 war.

Nearly the whole area was thick with timber. A great percentage was pine, the remainder being made up of oak, beech, and other growth of a smaller nature. The majority of rides separating the various enclosures were mainly bordered by oaks which reached an average height of, perhaps, fifty feet. The enclosures were so dense that the sun only penetrated in a few places. Consequently, every butterfly flew to the only place where they could find the sun—which was in the Rides.

The Rides were mainly bordered by oaks, making an almost unbroken "wall" from end to end. The Ride itself was rich with grass and a variety of low growing plants, while the borders consisted of a thick mass of low growing bramble and bracken.

From the end of June until the middle of July was indeed an exciting period. The Silver-washed Fritillary, *Argynnis paphia*, and the White Admiral, *Limenitis camilla*, really swarmed. I found the best policy was to choose a Ride which had the sun shining along one side only. You could walk along and study hundreds of *paphia* feeding on the bramble or sunning themselves on the bracken. Often I have stood and counted thirty around me—when making a swipe at one individual caused quite a commotion within a few yards, but almost within seconds they would return again. During 1939 I was standing at one end of a Ride waiting for the sun to appear. When it did suddenly come out I shall never forget the sight as I looked along the Ride to see *paphia* in their hundreds spiralling down from the tops of the oaks on to the bramble and bracken. It was reminiscent of an autumn day after a strong gust of wind. That year produced some fine varieties in *paphia*. Twenty var. *valezina* in a day was nothing unusual. I myself captured two hermaphrodites and one or two striking aberrations. *Camilla* too caused quite a bit of excitement; but, whereas *paphia* was almost everywhere, *camilla* had their favourite corners. Var. *nigrina* was turning up all over the Forest. On one particular day I captured three, all within a mile. Two others were caught, but being in poor condition were released.

Earlier in the year, too, with the Rides covered with large patches of Bugle, the Pearl-bordered Fritillary, *Argynnis euphrosyne*, was very numerous. Before they were over, the Small Pearl-bordered Fritillary, *Argynnis selene*, appeared in fair numbers, but, like the High Brown Fritillary, *Argynnis cydippe*, they were more plentiful in less wooded areas.

Then the war came and by 1946 nearly every enclosure had been cleared of timber, leaving a few scattered trees for seeding purposes. Practically every Ride during that period had been used by tractors hauling out the timber. All vegetation was destroyed, leaving each Ride a sea of mud. In the enclosures themselves, the undergrowth, exposed to the light for the first time, was rapidly growing—bramble being well to the fore.

The butterflies, then, instead of being attracted to the Rides as the only sunny places, found little difference wherever they flew—whether in the Rides or the enclosures, which in general appearance differed but little. Consequently, they spread over a vast area and even found, as the undergrowth became more favourable, new breeding grounds. Even the Dark Green Fritillary, *Argynnis aglaia*, made an appearance in some spots.

Bee Hawk Moths (both species) were ever elusive as they hurtled up and down a Ride with fleeting, hovering pauses at a Bugle flower; now, with no trees to steer them along the Rides, they were here, there and

everywhere! It is a hunter's nightmare. Your chances of being at the right "Bugle" at the right time were slim, indeed. Chasing is out of the question. Once, travelling at just under 40 m.p.h. on a motor bike, I was overtaken by one!

The enclosures, however, were being quickly planted with young pine; but a pine tree under a foot tall doesn't make much difference to its immediate area at that stage.

In the meantime various collectors visited the Forest about the same time of year as they had been used to do before the war, expecting to walk along the Rides and catch things as in the past. But with such a vast area to fly in, very few butterflies came into their sight. Another factor, too, was the fact that, regardless of season, nearly all species were appearing at least a fortnight earlier than had been their usual practice before the war!

The numbers were there, possibly with most species, as they had been before the war. *Paphia*, however, in 1946 were in greatly reduced numbers. *Cydippe* favoured the open spaces and were more common than ever before. Likewise with *euphrosyne*, but *selene* needed some looking for. The Duke of Burgundy Fritillary, *Hamearis lucina*, liked the new conditions and, although local in their habits, were easy to come across in fairly large numbers. The Purple Hairstreak, *Thecla quercus*, seen everywhere before the war, was seldom seen now, but you could find the larvae by beating, which proved that they were most certainly there. On the outskirts of the Forest the Brown Hairstreak, *Thecla betulae*, likewise could still be encountered.

Since 1946 things have slowly been on the change again. The enclosures are fast growing up. The undergrowth is finding less and less of the sun and is thinning and disappearing. The Rides are beginning to look more like normal with their patches of Bugle in spring and, later, bramble, etc. *Paphia* are appearing in increasing numbers each year and *camilla* can be seen in quite encouraging numbers in some of their old haunts. And, thus, as the enclosures grow, so will the butterflies be forced out again into the Rides where they can find their sunlight and nectar. Then in a few years' time will the New Forest once again become the paradise that was known by so many in the glorious past.

Ian G. Farwell (1445).

SCIENTIFIC METHODS IN ENTOMOLOGY

Although there is much sound advice to be found in Mr. P. L. Bradley's article on scientific methodicity in entomology, the whole of it is stultified in his concluding penultimate paragraph. He says, in effect, the insect is a machine, a mere robot capable only of obeying, willy-nilly, certain suitable stimuli. He does not tell his readers what the robot does when subjected to *unsuitable stimuli*. I know of no machine which possesses life, so perhaps Mr. Bradley will inform us what *life* is? Certainly, I do not know myself, although my profession is so largely concerned with the problems of life and death. Nor do I know of any scientist who can or who has been able to give a satisfactory explanation of what life is. The fact is, his advice to the young student is pernicious in that it is the essence of a blind materialism. In advising the young student to start off his investigations with the prejudged view that an insect is a mere machine, he is attempting to close the door to one important branch of investigation which would seek to show that the insect is something a little higher than a mere machine. In my years of wandering through tropical jungles, studying nature with ears to hear and eyes to see and understand, how often have I paused awe-struck at some fresh revealed marvel of nature? It did not occur to me that what I saw was but a mere machine, lifeless and without mentality; rather I found myself saying involuntarily: "This is the Lord's doing and it is marvellous in our eyes." I am by no means a religious man; science has undermined and robbed me of most of the beliefs that I was nurtured on, yet I can still regard the wonders of nature with reverence and as something beyond the grasp of our feeble intellect. Certainly I do not, and will not, regard an insect as a mere machine. Instinct is glibly spoken of by the materialist as something apart and different from mentality, yet the latter has been built up from the former, small beginnings to great endings, although the end is still afar off. My advice to the young student is to approach his problems with an open mind, unprejudiced by preconceived ideas or a cold materialism.

Lt. Col. F. C. Fraser, I.M.S., Retd., M.D., M.R.C.S., L.R.C.P. (890).

A BUTTERFLY'S "LOW" TASTES

T. S. Rutley (2114*) reports that, while walking along a woodland path near Maldon, Essex, last year, he saw a Pearl Bordered Fritillary (*Argynnis euphrosyne*) feeding on the remains of some unfortunate dead animal which had been partly devoured. It returned to feed after he had disturbed it. He wonders if it is commonly known that Fritillaries are, like the Purple Emperor (*Apatura iris*), attracted to such provender, or whether his observation was unusual.

●

REVIEW

Insects Indomitable, by Evelyn Cheesman. Illus. by Arthur Smith. 205 pp.; 17 line drawings. G. Bell, London. 1952. Price, 12/6.

As a field naturalist, the author of this book is well known and with her earlier books on subjects entomological has reached a wide public. In this, her latest work, she has excelled herself in writing of insect biology, an account packed with examples culled from first-hand observations made in tropic regions as well as in this country and with many references to up-to-date work on insect physiology, ecology, etc. In reading the accounts of some of the author's own observations, one is made to feel the deep interest—and even the excitement—she herself must have felt at the time: it is in this that much of the value of the book lies.

It should strongly suggest to young entomologists, and those of maturer age also, that to be only a collector of insects is not to get full value from the subject; but that to stand and watch the living insect in the field and to ponder over the why and wherefore of its activities can be not only pleasurable, but, more, may result in the discovery of something new.

The book is divided into eleven chapters and in each the author deals with one subject or aspect of insect life, starting with the elastic body and that remarkable variability of structure that has enabled insects to establish themselves in all parts of the world in unfavourable conditions. Chapter II, "Senses," treats of the importance of olfactory organs to some insects; of keen vision—ensuring the quick perception of prey, mates and colour—to others; while to some, organs productive of vibrations and organs for picking up these vibrations are essential.

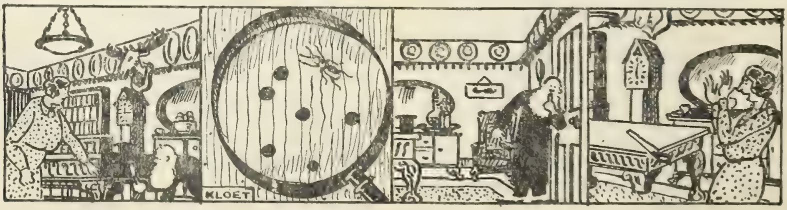
Protective devices, a subject widely studied by naturalists, fill chapter III, and here the author refers to remarkable examples of warning coloration, mimicry in its complex forms, as well as camouflage, witnessed by her both in New Guinea, a happy hunting ground of hers, and near to home.

Following chapters deal in the same pleasingly informative style with such subjects as "dispersal and migration"; the association of insects with plants and of insect parasites and predators, some harmful, others beneficial, to man. Pests, a problem created by man himself in his upsetting of nature's balance, fill chapter VII, and here again the author relates many of her own experiences.

Social organisations, with many references to observations of ant, bee and wasp communities in the Far East, make good reading in chapter VIII. The remaining three chapters have as their subjects "Instincts and Tropisms"; "Complex Actions" and "Individual Actions": each is full of interesting matter, provocative of thought. There is an adequate index.

The seventeen line illustrations by Arthur Smith are a joy to look at, particularly those of a bumble-bee pollinating an orchid and of a predatory bug, a veritable insect ogre, with its prey. The book, well printed and well produced, can be read with both pleasure and profit by entomologists and others interested in natural history. L. C. B.

Professor Fungus **By G. S. Kloet**



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EDITED by W. J. B. CROTCH, M.A., A.K.C.

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(e) By taking just that extra bit of trouble required to record happenings of note for the *Bulletin*.

AES
No. 149
BULLETIN
MAY 1953

OUR TWENTY-FIFTH LEAFLET

The publication of the series of articles on "Collecting Bumble Bees" in the *Bulletin* throughout most of last year met with very general approval. The Council felt that many members would like to have them in a more compact form, and they are now on sale as *AES Leaflet No. 25.* But the Leaflet is more than a re-issue, for the author has provided beautiful drawings of all the male genitalia: material which was hitherto available only in Dr. O. W. Richards' work in the *Transactions of the Royal Entomological Society, London,* 1927. Dr. Richards kindly lent Mr. Poole microscopic preparations for the purpose of his drawings.

So we believe we are offering you a wonderful two shillings worth in this, our "jubilee" leaflet.

●

FINDING OUT THE EGG-LAYING HABITS OF A CADDIS-FLY

(Miss Ruth M. Badcock, M.Sc., of the University College of North Staffordshire, has kindly written this account for the AES of an observation which she made.)

Adult insects are primarily terrestrial, air-breathing animals and only a few, such as the water-boatmen, certain other Hemiptera and water beetles, dwell in the water throughout the whole or major part of their lives, including the imaginal phase. These forms have special methods of obtaining air, often carrying their air supplies about with them and renewing their stock from time to time. It is unusual for aerial insects to enter water—and many would not survive it. Even the insects with aquatic nymphs or larvae do not usually go below the surface of the water to deposit their eggs. Most of them merely dip the tip of the abdomen in the water (Plecoptera, most Ephemeroptera and Odonata, some Trichoptera and Diptera), while some lay their eggs above the water which the larvae enter later (the alder-fly and certain caddis-flies). The few insects which have actually been seen to enter the water and lay eggs have occasioned considerable interest. These includes species of the ephemeropteran *Baëtis* (e.g., the red spinner) which have been recorded as crawling down emergent objects and laying their eggs while under water, also certain damsel flies (Odonata). There is a parasitic hymenopteran, *Agriotypus armatus,* which lays its eggs in submerged caddis pupae such as *Silo,* and it also crawls down solid objects into the water to seek its victim but comes to the surface every ten minutes or so to renew its air supply. An Indian moth, *Aulocodes simplicalis,* has been described as diving into the water when disturbed and it has been suggested that in suitable situations the female might enter the water to lay eggs, but this was not observed, and in a breeding jar eggs were laid above the water.

Some caddis-flies (Trichoptera) lay eggs surrounded by masses of jelly; the eggs of others are found in flat sheets cemented to solid objects such as the lower surfaces of submerged stones. While it was readily conceivable that jelly blobs might just be dropped into the water, it was difficult to understand how the sheets of eggs were cemented under inclined stones unless the female actually went under the water and put them there: yet the females had not been seen doing this, and for a long time people were rather sceptical about it, although there were a few indirect reports of caddis-flies swimming. However if you have not seen it happen, it may be somewhat surprising to think of a caddis-fly, which is rather like a hairy moth, going into the water. Yet it is quite certain that some caddis-flies do enter water. For example, Dr. Hora has described the females of an Indian caddis-fly crawling into the rushing water of a waterfall, and the finding of eggs in gelatinous masses on the lip of the fall; and I myself have watched the process of egg-laying in one of the caddises which lay eggs in flat sheets, namely *Hydropsyche angustipennis.* The original detailed account of my observations is being published in *Hydrobiologia,* but the gist is given here.

Many caddis-flies are active only towards dusk but *H. angustipennis*

flies during the day. On a sunny June afternoon when searching for caddises, I was fortunate to see a female imago alighting on a stone projecting above the water surface in an upland stony stream. She remained there for some moments with at first the tarsi of her hind legs, but later only the tips of her antennae, resting in the water. Then she flew two or three feet into the air, and after a rapid zig-zag flight over the stream, dived straight down into the water. She gleamed silver in it owing to the air carried down on her "hairy"* wings, and with these folded, she swam quickly to the lower surface of an inclined, submerged stone. The stream here was shallow (3 or 4 inches deep) and the current very slight. A few seconds later, when the stone with the imago on it was lifted, she had already laid some two dozen cream-coloured eggs in a flat sheet with transparent, colourless cement between them. Subsequently the eggs became buff-coloured and eventually turned orange, the colour diffusing to the cement also.

The captured female was kept overnight in a kilner fruit jar in which were placed a stone, bullrushes and water; the jar was covered with muslin, securely tied down. The caddis-fly rested on parts of the bullrushes projecting above the water. The next morning a movement of the jar caused her to come into contact with the water for a moment and she forthwith entered it head first, going to the submerged, lower surface of the stone. First, she moved her ovipositor tentatively over the stone, then started to describe an arc with the tip of her abdomen as she laid her eggs in a curved row, with their long axes parallel. As she moved her abdomen, she swayed on her legs and, at the end of the arc, stepped a little to one side. In doing so, she shifted her orientation slightly and this caused some confusion in the arrangement of the eggs at the edges of the cluster. Next, she moved her ovipositor back along the inside of the curve, depositing another row of eggs with their long axes parallel. She continued in a similar way, moving forwards a little now and then, until over two hundred eggs had been laid in dense, concentric rows. Then she crawled to another part of the stone, laying a second patch of eggs there, but when a lamp was switched on she moved away from the light, returning to the first patch and adding to it before laying yet another separate patch. Then, after being totally submerged for 37 minutes, she crept up the stone and, when all but the abdomen was out of the water, laid a final cluster of about 360 eggs. This insect had laid a total of some 840 eggs of which about 820 were deposited within fifty minutes and some 460 of them during continuous submersion. She lived for another day and a half under aerial conditions in the jar.

The precise method of respiration enabling this aerial imago to be active under water for so long a time needs further investigation. Probably the air carried down by the "hairy" body and wings is used, but this air may also function as a physical gill, renewing its oxygen from that dissolved in the water.

The observations noted above may be of significance in connection with the ecological distribution and population density of the species. The eggs and larvae of *H. angustipennis* are only found in certain streams or reaches of streams, and it is possible to interpret the behaviour of the female caddis-fly described here in terms of reactions to factors which may influence selection of sites for egg-laying and hence the occurrence of the larvae. When the antennae were dipped into the water, she may have been sensitive to the composition or temperature of the water, while the subsequent zig-zag flight may have been correlated with selection of the actual site for egg-laying. The vision of insects is imperfect, but the reaction may possibly have been determined by the intensity of light reflected from the stream-bed. The speed at which the water is flowing is likely to affect her ability to reach suitable sites for oviposition and there may be a mortality of females during spates if they cannot detect and avoid this condition.

There is plenty of scope for further investigation of egg-laying habits and I should be interested to hear if other insect enthusiasts can confirm this suggestion that a female caddis-fly may "examine" the water before egg-laying; also to hear from anyone who may observe caddis-flies entering the water, how they do it, the kind of stream used, and any other points of relevant interest, including the identity of the caddis-fly—or perhaps the specimen could be sent to me for determination.

*True hairs are found only in mammals.

INSECTS IN A COAL-MINE

In each of the two previous volumes of the *Bulletin* I have reported upon insects which I have found in a coal-mine. Last year (*Bull.* **11**, 23) I mentioned a micro which I believed lived and bred in the mine. It has been identified for me as *Tinaea pallescentella* Stainton* and I have kept a record of its appearances night by night on an average of six days a week throughout 1952. The results of my persistence astonished me, for only during November was it not to be found! Members may be interested in the following extracts from my record: —

JANUARY.—*T. pallescentella* was found in Ramcroft mine, Derbyshire, throughout this month. They are to be found in old workings and also in another part of the pit at the end of an air tube where they assemble in larger numbers. The tube is a yard in diameter, and the micros. seem to favour the mouth of it, but also venture a few feet inside. I counted twenty moths the first time I found them there and from fifteen to twenty every night throughout the month.

FEBRUARY.—The *Tinaea* can still be found in good numbers. The count for this month is 275.

MARCH.—Over 250 again counted this month.

APRIL.—The count of *pallescentella* has been equal to March.

MAY.—Twenty-four counted in the mouth of the air tube one day; moths never absent this month.

JUNE.—Seen in large numbers every night.

JULY.—*Pallescentella* still abundant in the air tube.

AUGUST.—No diminution from July numbers.

SEPTEMBER.—Most nights of this month only five were seen.

OCTOBER.—Only 60 *Tinaea* seen this month; no more than three a day.

NOVEMBER.—No micros. at all seen this month.

DECEMBER.—On the first day of December I found five moths again, so I continued my trudge to the air tube every day to find moths in twos and threes. On the 14th I counted fourteen moths; on the 22nd, nine; on the 29th, fifteen; and on the last day of the year, ten—making a total count of 91 for December.

I noticed that one of its habits is to fly in front of a light for a couple of yards and then dive down on to the dust. When settled there they are not easily seen, for the dust from the mine is greyish and this becomes mixed with a stone dust which is sent into the mine and makes a yellowish background which affords excellent concealment for *T. pallescentella.* Careful watching is, therefore, required to detect the moth, which, however, has another habit, that of moving its antennae to and fro while at rest, thus revealing its presence to the alert eye. Its flight is short and slow, but it runs fast when on the ground.

I have found the micro. only in the return airways and old roads; never in the air intakes. I am, therefore, confident that it lives in the mine. The average temperature is 58° F.

On February 23rd I found a beetle in the mine (later identified as *Chrysolina polita*): it may have been introduced in some clay.

In the following list of moths, the date of capture is given by numerals showing day and month (all were caught between 11.30 p.m. and 12.30 a.m.): —

A. caia 24.7.
A. triplasia 4.8.
A. grossulariata 8.8.
C. elpenor 10.6; 15.7; 16.7; 26.7.
C. elinguaria 4.8; 7.8; 8.8.
D. capsincola 31.6; 10.8.
H. nictitans 13.8.
L. impura 17.7; 4.8; 6.8.
L. pallens 14.8.
M. strigilis 26.6.
O. atrata 26.6.
P. tremula 28.7.
P. chrysitis 23.7.
P. iota 6.8.
P. gamma 12.9.
S. ocellatus 19.6.
S. populi 10.6; 3.7.
S. lubricipeda 28.5; 26.6; 4.7.
S. menthastri 10.6; 26.6.
T. gracilis 30.4.
X. monoglypha 23.7; 7.8.

W. BILBIE (1679).

(I am sure that many members would wish me to congratulate Mr. Bilbie on his perseverance in making such consistent efforts to record the presence of the micro. We hope to hear that some night in 1953 he has been able to trace where they are breeding. Broods would appear to be practically continuous and overlapping.—ED.)

*Identification confirmed by Mr. W. H. T. Tams.

COLLECTING COLLEMBOLA (3)

(*Continued from p. 28*)

Facts and Figures

According to Kloet and Hincks (1945) the number of British species of Collembola is 260, but this figure should not be taken as too accurate a guide, for several technical reasons which are beyond the scope of these notes. The approximate number of world species is in the region of 1,500. About 70 species are known to be injurious; the most notable of these in the British Isles is *Hypogastrura armatus* Nicolet 1841, a pest of the mushroom beds, roots of plants and seedlings. It is quite often to be found in daffodil bulbs planted in pots by school children and in many cases watered excessively, thus providing ideal conditions.

A species found to infest houses in Great Britain is *Seira buskii* Lubbock 1869, sometimes encouraged by the dampness of the house, or by the prevailing humidity in hilly districts, particularly in Lancashire and Yorkshire, also in parts of Scotland and Wales.

A springtail of considerable importance to the welfare of the country is *Hypogastrura viatica* Tullberg 1872, which is indispensable to sewage works in the British Isles, by keeping clear the sewage filter beds. When an old bed is abandoned and a new bed started, it is the custom in many places to carry a few spadefuls of the old bed to the new one; the purpose of this is to ensure that the new filter bed does not become choked with various growths. I would recommend this insect as being worthy of special attention by amateurs. This is, no doubt, the most common species concerned with filter beds, but it should be borne in mind that other species are likely to occur there.

Palaeontology

Too little study has been possible of the fossil remains of Collembola for much to be known. The best examples are found in amber, some of which go back to Oligocene times, about 45,000,000 years ago. The insects preserved therein must have been trapped by the resin exuded from a tree and eventually completely immersed, and so preserved in excellent condition. Some Arthropold remains found in flakes of Rhynie chert from the Old Red Sandstone of Scotland are believed to be the remains of Collemboloid insects, closely resembling Collembola of the extinct family *Poduridae.* One fossil specimen has been named *Rhyniella praecursor* Hirst and Maulik 1926 and a second specimen *Rhyniognatha hirsti* Tillyard 1928. There is considerable doubt whether they are true Collembola, as the thorax and abdomen of both specimens are unfortunately missing. If more complete specimens could be found it would have a profound effect on our knowledge of the evolution of the Insecta.

The keys which I give below closely follow the arrangement of Linnaniemi (1912). The modern tendency is to divide and redivide beyond reason: in my opinion this is unnecessary in such a small group. A nomenclatorial point causing some difficulty to newcomers is that Linnaniemi chose the name Axelson, so as to avoid confusion should any future author use the abreviation Linn., thus confusing Linnaniemi with Linnaeus.

Key to Sub-Orders

1. Body elongated. Head horizontal. Segments of the thorax and abdomen distinct, but abdomen iv, v and sometimes vi fused. .... ARTHROPLEONA.

2. Body subglobular. Head vertical. Segments of thorax and abdomen fused, but abdomen v and vi usually distinct. .... SYMPHYPLEONA.

Keys to Families of Arthropleona.

1. Prothorax bare dorsally, nearly always membranous; usually covered by forward projecting mesonotum. Cuticle smooth or minutely granular with hairs or scales. Furcula absent (there are a few rare exceptions.) ...... ENTOMOBRYIDAE.

2. Prothorax not bare dorsally; never different from dorsal plates of other segments; not covered by projecting mesonotum. Cuticle granular or tubercular without scales. Furcula often absent. .... PODURIDAE.

Keys to Families of Symphypleona.

1. Antennae shorter than head; dentes usually 2-segmented; minute.... NEELIDAE.

2. Antennae longer than head; dentes not segmented; size variable. .... SMYNTHURIDAE.

I am willing to answer any queries and give any help necessary in matters of determination for the cost of return postage, if AES members write to me at 2 Clifton Close, Glodwick, Oldham, Lancashire.

PETER R. BARRATT.

POSTSCRIPT.—I apologise for the omission of the pre-coxa on p. 17, second column, line 20. The first line of the next para. contains an error: there are, of course, six segments of the abdomen (as shown in the diagram.)

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LARVAL FOOD RANGE AND POSSIBLE EFFECTS (2)

(Continued from p. 30)

Having considered some of the physical connections between larvae and plants, we must now turn to the chemical relationships. Here we are mainly concerned with the effect of the plant upon the colouration of larvae and adults. Before doing this, however, let us see how colouration is produced in insects. Colours may be produced by:—

(i) structure of parts of the cuticle;
(ii) pigmentation;
(iii) a combination of (i) and (ii).

Those in group (i) are mainly due to selective reflection and refraction of light from reflecting surfaces. The iridescent colours which occur in many insects are almost all due to interference in the reflection of light from multiple thin plates.[3 6] Other metallic colours may be due to the scattering of short light waves by minute particles and diffraction of light at grooved surfaces.[4 5 6] Recently Anderson and Richards have shewn, by the use of the electron microscope, that horizontal plates and ribbing occurred in several species of insects which they investigated.[7] A great deal more work needs to be done on these topics before we can give a satisfactory explanation.

Group (ii), pigmentary colouration, is the main topic of this article. Pigmentary colours fall into four main groups:—(a) chlorophyll and other derived pigments, (b) haemoglobin and allied pigments; (c) pigments with protein bases; (d) pigments with purine bases.

Poulton[8] carried out experiments which suggested that the green colouration of many larvae was derived from the green colouring matter of plants, chlorophyll. If the green pigment of the blood and integuments is examined spectroscopically it will be found to have almost the same spectral lines as that of chlorophyll. The chlorophyll usually becomes modified as the result of digestion in the insect's body. An interesting experiment is to feed green larvae on colourless leaves devoid of chlorophyll. A suitable plant can be grown from seed in the dark. The larvae will become white, but when fed again on normal green leaves, the green colouration will return. It has been found, by several workers,[9 10] that the green colouring matter is not chlorophyll. The complex green colouration is now called insectoverdin and is formed by a yellow-orange carotinoid and a blue bile pigment, probably mesobiliverdin.[11] In some cases the green colouration of insects develops only under certain conditions. It has been

3 Wigglesworth (1949) *Biol. Reviews* **23**, 419-420.
4 Mason (1926-27). *Journ. of Phys. Chem.* **30**, 383; **21**, A, 321; B, 1856-1872.
5 Onslow (1921). *Phil. Trans. Roy. Soc.* B, 211, 1.
6 Imms (1937). "Recent Advances in Entomology". Churchill.
7 Anderson and Richards. *Journ. Appl. Phys.*: **13**, 748-58.
8 Poulton (1893). *Proc. Roy. Soc.* B, **54**, 417.
9 Toumanoff (1927). *C.R. Soc. Biol.*, Paris **96**, 1392.
10 Faure (1932). *Bull. ent. Res.*: **23**, 293.
11 Junge (1921). *Hoppe-Seyl. Z.*: **268**, 179.

shewn that the green colouration of the African locust (*Locusta migratoria*, subsp. *migratorioides*) only develops in a high humidity.[12, 13]

Chlorophyll consists of 4 main compounds (recently it has been divided into more than 10 compounds). These are chlorophyll *a*, which is bluish-green in colour; chlorophyll *b*, which is yellowish-green; carotin, an orange-yellow unsaturated hydrocarbon; and xanthophyll, the dioxide of carotin, which is yellow.

Gerould[14] found that the usual yellow-green colouration of the larvae of *Colias philodice*, which is related to the Clouded Yellow, *Colias croceus*, was changed to a bluish-green colouration in a mutation. He came to the conclusion that the normal yellow-green colour had been broken down or decolourised and that the blue-green colour of chlorophyll *a*, which had been left intact, now gave the larvae its colouration instead of being masked by chlorophyll *b*.

It is impossible to give a long list of examples in a short article. Those interested are referred to the following papers noted at footnotes 4, 6, 8, 20, and 21.

Mention may be made that external factors such as temperature, humidity and sunlight can have profound effects on colouration by pigments. Many compounds derived from plants become oxidised when heated and may change in colour. Thus Knight[13] shewed that when *Perillus*, a Pentatomid bug, was reared at temperature between 85° and 95° F., white forms were produced, while at temperatures below 75° F. red and yellow forms were produced.

Not all green colours are pigmentary. Schmidt[16] has recently shewn that numerous thin plates are responsible for the green colouration in the scales of the Green Hairstreak butterfly, *Callophrys rubi*, and certain Papilionids.

Haemoglobin and its allied pigments are not often found in insects; the red and yellow colouration of the Small Tortoiseshell, *Aglais urticae*, and the Peacock, *Nymphalis io*, belong to this group.[6]

The most important pigments in the protein group, as far as colouration is concerned, are the melanin group; these being derived from amino-acids which have been oxidised by enzymes. In this process they become dark compounds. The black markings on the wings of the Cabbage White, *Pieris brassicae*, are due to melanin.[5] The many recent melanic forms which have been described in recent years belong to this group.

Pigments with purine bases have not, so far, been found in many insect colourations. Uric acid, a white compound, is deposited between the wing membranes of the white butterflies, *Pieris* spp. These compounds are formed as the result of the decomposition of nucleic acids. In the white butterflies it has been found that the white colouration is primarily due to structural features and air-spaces.

How is it possible to find out whether a colouration is pigmentary or structural? If the colouration fades after death and can be changed or altered by heating or by chemical methods, then the colouration is pigmentary in nature. If the colouration remains after this treatment then a structural colouration is probably present. Structural colourations will often disappear if placed in a liquid of the same refractive index. It cannot fade or be destroyed by chemical methods. If the colouration is partly altered then the colouration will probably be of the structural and pigmentary combination (iii). By the above methods it can be found to which group the various colourations in (iii) belong.

Many insects' colours are in group (iii) and have both structural and pigmentary colouration. To get rid of the pigmentary colourations, if they exist, bleach with hydrogen peroxide and any colour which remains will be structural. The two or more colours are often different and combine to produce another colour: for example, in *Teracolous phlegyas* the red pigmentary colour with the structural purple produces magenta.[6] In other cases one colour often masks or hides the other colour.

Brief mention must also be made of the genetical side of the problem. It is well known that certain enzyme actions are regulated by genes. As an example we may take the eye colouration of the famous fruit fly, *Drosophila*. This example will shew how complex colouration can be.

Before synthesis of the red eye pigment can commence, tryptophan

12 Faure (1932). *Bull. ent. Res.*: **23**, 334.
13 Hertz and Imms (1937). *Proc. Roy. Soc.*, B, **122**, 281.
14 Gerould (1921). *Journ. exp. Zool.*, **34**, 385.
15 Knight (1924). *Ann. ent. Soc. Amer.*, **17**, 258.
16 Schmidt. *Z. Morph. Okol. Tiere*: **39**, 176-216.

must be present in the body of the animal, and this is probably obtained from the larval food-plant. Before the next stage can take place a gene has to be present, which we can call v+. If v+ is absent the colouration of the eyes will be vermilion. If present the v+ gene seems responsible for the production of kynurenine from the tryptophan. If the gene *cn+* is present it causes the kynurenine to be converted to chromogen; if absent the eye colouration will be cinnabar, as well as the rest of the body. If another gene *bn+* is present the red eye colouration will be produced, if not brown coloured eyes will result[17].

Three genes appear responsible for the magenta colour of *Primula sinensis.* These can be all present, or some missing. Seven different colours can occur as the result of certain combinations of these genes, which are either dominant or recessive:—magenta, red, blue, slate, nearly white, coral and pale coral.[17] Conditions of the above kind occur in many insects and give rise to many colour varieties, for example, *Arctia caja* and *Abraxas grossulariata.*

These types of reaction are only a few of the many complicated reactions that go on in an insect's body which combine to give the final effect. If any one of these chemical reactions does not occur then the organism becomes altered and in most cases death results. Add to this the numerous chemical reactions that take place when the insect eats and uses its food for energy and other purposes, then we have a very complex system. With this in mind we must realise that changes in colouration may not be due to food-plants but to other reactions.

Therefore, experiments done by AES members can only show the way to further experiments done on a large scale, and in controlled conditions. It is only by experiments that any reliable new information can be gained about this little-explored subject and studies by AES members *can be of great value and lead the way to further experiments which will be able to reveal the mechanisms of changes in colouration and allied effects.*

(*To be continued.*)

J. P. Savidge (2041).

17 George (1951). "Elementary genetics." Macmillan and Co. Ltd.

ON BOOK REVIEWS

The Editor would like members to reflect for a few minutes about book reviews: and may he be permitted the simplicity of the first person singular?

I was prompted to think about the subject again by a note in my post-bag which I quote *in extenso*:—

"Object (No. 2 of the AES Rules) reads—' The promotion and dissemination of Entomological knowledge by every means possible and particularly the encouragement among the younger generation of a keen and a broad interest in the science.'

"The AES depends for its future existence upon the subscriptions of the younger members and those who may become interested members in the future.

"In my opinion the best way to get younger members or non-members interested in the Society is by literature and those members who use their time and money to write for publications are doing the best possible service to the AES and carrying out their obligations. With this in mind, I felt very perturbed when reading the criticism on 'Transformations of Butterflies and Moths' in the January issue of the *Bulletin* (p. 8).

"Younger people and even older interested people reading such an onslaught by one member (if A. E. H. is a member), on a fellow member's endeavour to carry out his obligations to the society as Hugh Newman has done by publishing this book, would think very seriously before becoming a member of a society whose members go to such lengths to criticise each other in print; and would no doubt join some other society which would seem more harmonious.

"May I suggest that all members look for the best of endeavours of fellow members and, if a member disagrees with a fellow-member's work, he writes or speaks directly to him as a brother in affliction, rather than force his comments in the *Bulletin*, so that the space thus available can be used for really useful articles.

"As one of the not so young members, I hope this advice may be of service and will be accepted in the spirit in which it is given."—F. Bickerstaff (2078)."

I do not remember having had the pleasure of meeting Mr. Bickerstaff, but I think of him as one of those who are the very marrow-bones of a good amateur society, kindly, en-

thusiastic and ready to help any fellow-member.

Of the review in question, I should like to say three things and no more. First, neither Mr. Newman nor his publisher has complained; second, I am confident that there was no personal animus in the review; third, when handling the book, I had myself felt a sense of disappointment that so handsome a volume had been marred for lack of perhaps another dozen hours of work upon its preparation.

WHY ARE BOOKS SENT FOR REVIEW?

Presumably publishers send books to relevant periodicals for review because it brings them to the notice of specially interested groups of people and provides a new fillip to sales some little time after the initial paid advertising has ceased to have effect; and also because choice snippets of independent appraisal can be quoted in "second-round" advertising.

HOW ARE REVIEWERS CHOSEN?

Reviewers are all members of the AES. I select them from the Membership list; or on personal advice from the Council or by my own knowledge of their likely interest in the subject matter of the book. Members often appear to be astonished at being "picked upon," but most accept the task (and the book). Recent reviewers will forgive me when I state that, in general, I select them not because they are "experts" who will give learned judgments, but as enthusiasts who will give an amateur's reaction. We are the Amateur E. S. after all.

WHAT IS THE PURPOSE OF A REVIEW?

The main purpose does, indeed, accord with our object. Of nearly a thousand members, perhaps two-fifths are removed from large centres of population where they could browse round well-stocked bookshops to handle the book and make a personal judgment of its interest or usefulness to them. Nearly another fifth are Junior Members, not all of them sufficiently self-confident not to like some guidance from an older amateur.

DE LIBRIS AMICI NIL NISI BONUM?

Is a review then to be considered as another form of advertisement for a book; or as a frank assessment of its value to amateurs who have not had a sight of it themselves? Kindly Mr. Bickerstaff suggests that if an author is also a member of the AES we should say nothing in print which is less than praise. Do other members really feel that way?

Let us imagine a reviewer receiving a book "The A B C of Insects" by Hack Cashin, published by Messrs Very and Respectable Ltd. He dashes off a review as follows:—

"The author of this book obviously seeks to profit from the current increase in interest in Nature Study and particularly insects. Unfortunately Mr. Cashin has misunderstood most of the sources he has quarried and ludicrous errors pepper every page. To crown all, he and his publishers know so little about entomology that they have allowed the captions of the illustrations to be reversed and figure a Cockchafer as a Purple Emperor. We do not recommend any member to waste money on this book."

But before posting his review, he turns to his copy of the Membership List and finds CASHIN, H. (gen. ent.). He is appalled. On the doctrine of *De libris amici nil nisi bonum*, he racks his brains and sends the unsuspecting editor the following:—

"This is a quite astonishing symposium and remarkably illustrated."

Do all the other members deserve that, just because Mr. Cashin paid 12/- for membership of the AES?

Comments really will be welcome.

W. J. B. C.

Professor Fungus **By G. S. Kloet**

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THE BULLETIN OF THE AMATEUR ENTOMOLOGISTS' SOCIETY

EDITED by W. J. B. CROTCH, M.A., A.K.C.

AES NOTICE

WHERE TO WRITE

Applications for new membership; offers to help with AES work; Exchange Notices to: E. LEWIS, *8 Parry Road, London, S.E.25. (Wants and Exchanges Lists are circulated in March, May, July, and October and notices must be received by the 15th of the previous month.)*

Advertisers to: L. W. SIGGS, *10 Repton Road, Orpington, Kent.*

Non-arrival of Bulletins *and changes of address should be reported to:* B. L. J. BYERLEY, *48 Elmgrove Road, Harrow, Middlesex.*

Offers to lead Field Meetings, exhibit, etc., to: K. H. BOBE, *19 Hengist Road, London, S.E.12.*

Manuscripts, drawings and books for review to: W. J. B. CROTCH, **6 Balmoral Mansions, Clevedon Road, Twickenham, Middx.**

Subscriptions (12/- per annum, 6/- for Juniors) to: P. C. LE MASURIER, *85 Warren Drive, Tolworth, Surrey.*

AES BULLETIN

No. 150

JUNE 1953

FLUCTUATION IN NUMBERS IN THE MARSH FRITILLARY

As a result of the very few letters which I have received concerning my report of the sudden drop in numbers in the Cumberland colonies of *Euphydryas aurinia* Rott. (the Marsh Fritillary) it is now possible to piece together a few strands of evidence which, though they are still far too scanty, are worth publishing in the hope that members will be encouraged to produce further evidence about past years and to seek evidence of the condition of colonies this season (1953).

If one puts evidence concerning five colonies in table form the result is as follows: —

Situation	1947	1948	1949	1950	1951	1952
1. Extreme South	Quite common	Abundant	Slightly less abundant	Less common	Definitely becoming uncommon	Not seen at all
2. Home Counties	Abundant	Abundant	Very abundant	Very abundant	Vastly reduced	Only two specimens seen
3. West England	Abundant	Abundant	Abundant	Weaker	Very few seen	Apparently gone
4. North Wales	Flourishing	Flourishing	Flourishing	Flourishing	Great reduction	Comparatively very few
5. North Cumberland	Abundant	Very abundant	Very abundant	Exceedingly abundant	Vastly reduced	Very few specimens seen

This evidence, though it needs to be greatly supplemented, is, to put it mildly, impressive. The parallel is remarkable, especially when one considers that the species in question is so local that each of the colonies referred to here inhabits an area hardly larger than an average field. That the same thing should have happened from the extreme South to the extreme North of England suggests that there must be one main underlying cause. The following suggestions have been made to me: (a) A vast increase in the species' ichneumon-parasite. This may have happened, though I have no evidence that in 1951 the colonies were strewn with dead larvae beside batches of ichneumon pupae. It seems that the larvae just were not there at that stage and the tragedy which overwhelmed them must be put further back in their life-cycle. In any case this only pushes the main problem a stage backwards, for why should the ichneumon so suddenly increase in numbers, particularly since this must have happened at the same time over such a wide area? (b) That birds are partly responsible. Indeed, a vast concourse of insects such as occurred in Cumberland in 1950 might attract more than the usual attention from birds, but smaller colonies have been involved where the numbers were not so phenomenal. (c) That the damage was done by spiders. I am unable to comment on this, as my knowledge is not adequate, but clearly they must do a lot of damage, to larvae far more than to imagines. There can be no doubt that ichneumons, birds and spiders have all played their part in producing the present situation, but somehow I cannot feel that in any one of them or in all three together we can see a sufficient main underlying cause to explain what has happened so widely and simultaneously. The fact that Colony 1 in the table above reached its optimum year before the other colonies hardly alters the general picture, for it was only in 1951 that the species there became definitely scarce. Also the fact that the situation in Colony 3 was complicated by the circumstance that the original site was becoming overgrown with coniferous trees does not render the evidence from this colony invalid, because only a short migration of a few hundred yards would have enabled the colony to survive in suitable surroundings. So the crucial season was 1950-51. One is tempted to seek a climatic factor, but the climate

is in any case so different at the two opposite ends of the country that it is impossible to guess what such a climatic factor could have been. The South Coast and Cumberland are frequently in different airstreams or in very different parts of the same airstream and I do not believe that the season 1950-51 was any different from the normal in this respect, except, it may be, in the fact that the Spring of 1951 was everywhere cold and late.

One can only emphasise that much more intensive and continuous observation is needed before there can be any hope of reaching the truth about this intriguing problem.

J. H. Vine Hall (1520).

BUTTERFLY COLONIES

I read with great interest the Rev. J. Vine Hall's article on "The Changing Scene" in the February *Bulletin* (p. 12). I have for many years now visited annually a colony of *E. aurinia* in the Longland Woods, just over the Somerset border in Wiltshire.

There was a clearing, low lying in the woods, where the food-plant was abundant and where up till 1950 there was a strong colony. The clearing had, however, been planted with conifers and was by then getting rather overgrown at the expense of the undergrowth. In 1950 the colony was weak; I saw few more than half a dozen in 1951; and last year there were none at all.

There are open rides, running parallel with the old clearing, where the foodplant still abounds—and yet no sign of butterflies. It may be that the colony has shifted, but so far I have not been able to discover it. It was one which did not produce much variation but was a quite bright red form of largish size.

I suppose that the loss of the colony can be attributed to the growth of the trees and consequent stifling of the food-plant in this particular ex-clearing, but one would have expected that the colony could easily survive by moving only a few hundred yards. I shall go again this year and will report any significant alteration.

G. H. W. Cruttwell (118).

A MARSH FRITILLARY GROUP?

Many of our members will have read the previous interesting articles by the Rev. J. H. Vine Hall on colonies of *E. aurinia* in the AES *Bulletin* for August 1951 and February 1952, as well as that above.

A request for members to send in notes and observations on colonies of this insect during the years mentioned in the articles did not receive a great deal of support. This was rather disappointing, as it must be one of the most interesting butterflies to study. Many of us must know of a colony which we like to visit each year, just to see how it is getting along, without necessarily collecting. Each colony seems to have periodic fluctuations, and regular reports would be the first step that members could take in the formation of a study group, of which I have promised the Rev. J. Vine Hall to act as secretary.

Will those members who are prepared to make short regular reports each year on a colony please let me know? Details of exact localities are not required. This group could be one of the best in the AES, but it is up to you!

S. M. Hanson (320).

ANNUAL GENERAL MEETING

The Annual General Meeting was held, by courtesy of the Linnean Society, in their rooms at Burlington House on the afternoon of Saturday, 21st March 1953. It was preceded by a conversazione and by the showing of entomological films of more than ordinary interest.

As a result of uncontested elections, the AES Council for 1953-54 is constituted as follows:—

President: L. W. Siggs (243).
General Secretary: E. Lewis (952).
Treasurer: P. C. Le Masurier (978).
Editor: W. J. B. Crotch (1181).
Publications Secretary: C. B. Pratt (784).
Meetings Secretary: K. H. Bobe (912).
Youth Secretary: S. M. Hanson (320).
Advertising Secretaryship: Temporarily retained by L. W. Siggs.
Councillors: A. N. Brangham (18), W. B. Broughton (1632), L. C. Bushby (1075), B. L. J. Byerley (788), D. I. Chapman (1648*), B. A. Cooper (19), R. Hilliard (99), C. H. Ison (1343), N. A. Lockington (1421), H. K. Airy Shaw (545), R. G. Shaw (1486*).

The General Secretary presented the Council's Report which is printed below. The Treasurer's Report will be circulated in a later issue of the *Bulletin*.

COUNCIL'S REPORT FOR 1952

During 1952 the membership of the Society again showed a marked change in its composition, but little in numbers. The membership at the 31st December was 905, made up of 684 Ordinary, 192 Junior, 22 Associate and 7 Honorary members, compared with 943 a year before. New and re-joined members numbered 65 Ordinary, 61 Junior, and 5 Associate members, a total of 131. Junior members are thus still less than one-quarter of the membership, but nearly one-half of the new members were Juniors.

It is a pleasure to record that Professor F. Balfour-Browne accepted the Council's invitation to become an Honorary Member of the Society. A similar invitation was sent to Dr. K. G. Blair, but it was a cause of deep regret that he died within a few days of the invitation.

The new Constitution and Rules, which received unanimous approval at the Special General Meeting on the 27th September, and were later confirmed without opposition by postal ballot, were adopted on the 1st December.

The *Bulletin* appeared punctually each month, and the volume contained 116 pages. The usual four Wants and Exchanges Lists were circulated. One new publication was issued: Leaflet No. 24, "The Entomology of Bird Pellets," by Mr. P. M. Miles. Dr. J. Cloudesley-Thompson's article on "Collecting Centipedes and Millipedes" was reprinted from the *Bulletin*, and is listed as Leaflet No. 23.

The Annual General Meeting, preceded by a film show, was held on the 29th March in the rooms of the Linnean Society, to whom the AES is again indebted for hospitality. After the formal business the President invited criticism of the Society's activities and suggestions for improvement; useful discussion followed.

The Annual Exhibition, held on the 27th September, was most successful, and the Society's thanks are due to all those whose active support made this pleasant occasion possible. A full report was published in the *Bulletin*.

Two Field Meetings were led by the Youth Secretary.

The Diapause Study Group carried out experiments on three species of Lepidoptera with interesting but as yet inconclusive results.

The Elephant Hawk Group circularised Lepidopterists among the membership for records of captures of larvae. 30% replied, and a preliminary count showed that the Elephant Hawk is markedly commoner in the Midlands than in the south. Experiments suggested that there is some relation between light intensities and larval colour.

A Microscopy Group was started in August, and membership at the end of the year totalled thirteen. In October the Group launched a bi-monthly "Circular Bulletin," to which each member adds comments and suggestions as it goes round. A section was started for instruction in simple methods of making slides.

The Silk Moth Group continued to work steadily. As the result of a cross pairing, a new true-breeding sub-species of *Philosamia cynthia* was isolated. Members carried out experiments by adding one of the natural sugars to the normal diet of some Saturniid larvae. Most members of the Group lunched together before the Annual Exhibition, one travelling from Southport to be present.

The progress of the Pupal Emergence Group was of necessity rather slow, despite enthusiastic contributions by a few members of the Society. Sufficient material has been collected to enable a short report to be sent to the Bulletin, which it is hoped will stimulate more members to send data to this Group. The main aim is to establish whether different species of Lepidoptera choose different times of the day and night to emerge from the pupa, by the tabulation of numerous observations. It was established that some species appear to favour specific times for eclosion, and that these times are fairly rigidly maintained in captivity.

The Blues Group has over 30 members, and specimens of the Common Blue collected from 25 counties and islands provided a basis for a study of the distribution of local forms. There was a marked scarcity of all Blues, and little variation was observed.

No support was forthcoming for the Cockroach and Ecology of Ponds Groups, and no information has been received concerning the Insect Galls, Larval Colours, Orthoptera and Weevils Groups.

Seven ordinary and two special Council Meetings were held, with an average attendance of eleven.

E. Lewis (952),

Hon. General Secretary.

LARVAL FOOD RANGE AND POSSIBLE EFFECTS (3)

(*Continued from p. 39*)

Before we actually begin experiments, we must look at the conditions under which they are to be carried out, because a change in larval colouration may be due to them and not the food-plant. Experiments carried out in jam-jars are just as good as those carried out in expensive breeding cages, provided that we say that we used jam-jars in our reports. More important is the situation of jars or cages, whether we have them in a sunny situation, in a semi-dark room, or in a cold outhouse; whether we have a fine gauze keeping the larvae in their cage or a large meshed wire gauze.

We must also state what species of plant we feed our larvae on. It is not good enough to say we feed them on "fruit-trees," "grass," or "ferns." We must positively identify the species. (Local help can usually be obtained but, as a last resort, a plant for identification may be sent to Mr. H. K. Airy Shaw (545) who is on the AES Advisory Panel, or to myself.) We must also give the locality from which we got our food-plants and in what type of habitat they were growing: for example, a damp pine wood, a salt marsh, or a chalk pond. The ultimate cause for a change in larval colouration might be due to the place in which the food-plant grows; for in that area there might be the lack of an element or compound in the soil which the plant normally uses and the larva eats, via the plant's leaves. This compound may be part of one of the enzymes which, as in *Drosophila*, is one of a series in a colour sequence.

It is of the utmost importance to give fresh food each day to the larvae. Various changes set in after the leaves have been picked and the new substances which may be formed might cause a change in larval colouration. The whole plant may, however, be placed in a corked jar in the breeding cage, with the leaves above cork level. A supply of plants may be kept for some time in a jar of water, or, better still, in a culture solution, in a sunny position, but not in direct sunlight.

We can now see why it is important for us to report fully upon our experimental conditions. If we find a colour change, other experimenters can then carry out the same experiment under similar conditions to see if they can induce the same effect.

Now for some suggested experiments. Many of them are very simple, but from them valuable information might be obtained. Readers will, no doubt, think of others to do as well. Let us begin with experiments connected with the relationship between larvae and plants. When you find a larva feeding on a particular species of plant, collect it and rear it in your breeding cage: once established, see if it will feed on any other plants belonging to the same genus and family. For example, if you find an Elephant Hawk, *Deilephila elpenor*, larva feeding on Rose-bay Willow-herb, *Chamaenerion angustifolium* (L.) Scop. (=*Epilobium angustifolium* L.) see if it will feed on ordinary Willowherbs (*Epilobium* spp.); and then on other plants of the same family, such as the Evening Primrose, *Oenothera* spp.; Enchanter's Night-shade, *Circaea* spp.; *Ludwigia* spp., and *Fuchsia*. Finally you should see if it would feed on plants of closely related families, such as Loose-strife. I found several new food-plants for *D. elenpor* by such experiments.

The large White Butterfly, *Pieris brassicae*, can be fed on various species of the Cabbage family (*Cruciferae*). Find out if larvae which normally feed on smooth-leaved plants will feed on hairy-leaved species. You can make your experiments with any kind of butterfly or moth (or even another order of insects). Very common species are particularly useful, since numbers of larvae of the same species can be obtained for a series of experiments such as the next. Give the experimental larvae a wide range of food-plants and find out their preferences. See whether a larva that has been feeding on one species of plant will change to feeding on another immediately after a moult, although it has refused the new plant between moults.

It may be particularly useful to breeders if you find an alternative species of plant for the larvae of an insect which, as far as is known at present, is restricted to one species of plant.

We can now think of some experiments which might change colouration a great deal. Thus we might put a plant in a culture solution and then add minute traces of easily obtainable chemical substances, especially those containing 'trace' elements. Within recent years it has been found that plants and animals, in order to develop fully, need minute traces of

certain elements. These are present in the soil in very small amounts. Too much of a trace element injures the plant. It has been found that broad-beans grown in a culture solution free from boron do not complete their development. If traces of boron are present, in amounts varying from one-tenth part to forty parts per million, normal growth results. If present in quantities above two hundred parts per million, the plants are injured.[18] Deficiency diseases are caused by deficiencies in 'trace' elements and often blotching of leaves results. Animals, including insects, also require these 'trace' elements, which they obtain from plants. Thus cows require traces of cobalt which occurs in minute traces in the grass they eat. If the soil beneath the plants is short of cobalt, then the cattle suffer by not being able to get it via the plants.[19]

For those who wish to make a water-culture solution the following formula is suggested: —

Potassium nitrate	1.00 gram
Calcium phosphate	0.50 ,,
Magnesium sulphate	0.50 ,,
Calcium sulphate	0.50 ,,
Sodium chloride	0.25 ,,
Ferrous sulphate	trace

This should be dissolved in 1,000 c.c. distilled water. Most chemists would be willing to make up the dry constituents for you. The solution should be regularly aërated. This can be done by placing a rubber tube into the solution and blowing air through it for a short time. The roots (or cut stems) of plants should be placed in the solution, which should not be exposed to direct sunlight.

Having made a water-culture solution, we can either start leaving some compound out, or, better, one by one, add minute traces of various compounds to the solution, such as cobalt, zinc, copper, bismuth, in the form of one of their salts. One crystal of the latter substances will be sufficient. Leave the plants in the solution for at least a day before feeding them to the larvae.

A variation on the last experiment is to place some normally accepted food-plant in a jar of water culture, or just water, which is neutral to litmus paper. Then add the same species of plant to another jar, under the same conditions, but this time make the solution slightly alkaline (turning red litmus paper blue) and have another jar with a slightly acid solution. Then after the plants have been kept for a day or so in such solutions, feed them to various lots of larvae of the same brood, but in different cages, giving one cage acid leaves, another alkaline leaves and so on. Many red and blue colours are anthocyanins and they change from blue to red and *vice versa* on a slight change in acidity and alkalinity. This happens in many of the flowers of the family *Boraginaceae*; for example, those of the Forget-me-not, *Myosotis* spp., change from a red to a blue colour as they open, because the sap in the petals alters from acid to alkaline as the flower opens.

Mention has already been made about feeding green larvae on plants that have been grown in the dark and then feeding them on green plants again.

Our aims should be to see whether different food-plants produce changes in the colour of the larvae or imagines. Remember that changes in tints of the same colour, for example the various shades of green, may be just as significant as changes to different colours. To see changes in tint it is useful to rear some larvae under normal conditions. Mr. W. G. C. Booker's experiment (*Bulletin* **11**, 107) was of this kind. He found that some larvae of the Cinnabar Moth, *Hypocrita jacobaeae*, which fed on Wild Parsnip, *Pastinaca sativa* L. produced imagines of a deeper red colouration. Perhaps some other AES members would like to carry out a similar experiment.

We must remember that most of our experiments are not likely to reveal any changes in colouration at all. If, however, we carry out enough of them we may chance upon some interesting results which will help in advancing our knowledge of entomology. The main thing is to be persevering and systematic.

For Junior Members

The above experiments should provide interesting work for junior members, especially in the long summer holidays. You do not have to master the technical knowledge in order to carry them out. As long as you note the experimental conditions and pro-

18 Brenchley (1936). *Bot. Rev.*, **2**, 173.

19 Stiles (1946). "Trace Elements in Plants and Animals." Cambridge University Press.

cedure and are not disappointed if you do not get any startling results at first, you will be rewarded and may be able to make a valuable contribution. Moreover, such simple experiments provide a good starting point in experimental work and will be particularly useful if you intend to carry out complicated research in future years. If you have any difficulties or like to ask any questions, no matter how simple, based on this article, I shall be very pleased to try and answer them for you. Please remember to send a stamped envelope for the reply.

20 Thompson (1926). *Biochem. Journ.*, xx, 73, 1026.

21 Packard (1898). "Text-book of Entomology". Macmillan.

J. P. SAVIDGE (2041).

APPEAL FOR SPECIMENS OF APIDAE

The Bee Research Association has recently established the National Beekeeping Museum, which is at present housed in the Museum of English Rural Life (Reading University). We should like to appeal to members of the AES to help with the natural history collection for this Museum. At the present time we want specimens of any British Apidae (all castes, adult insects only). Specimens should be sent to D. M. Jesper, F.R.E.S. (1152), Kimarna, 23 Woodlands Grove, Harrogate, Yorks., who is in charge of the collection; they should be accompanied by details of the locality and date of capture, and also the distribution of the species in the locality if this is known. It will help if specimens can be supplied set; but if not, they can be stored in tissue paper in a laurel container with the necessary data. Small consignments soon after capture would be more useful than a large consignment at the end of the season. Specimens sent from the field need not be named, but details of capture should be included. Postage will be refunded on request.

Duplicate specimens held by members, and especially any existing collections which could be spared, would be welcomed.

E. E. CRANE,
Bee Research Association.

R. M. DURUZ,
Keeper, National Beekeeping Museum.

SOIL-LESS CULTURE AND THE LEPIDOPTERIST

In the past year and especially during the winter, I have used soil-less culture as a means of obtaining food-plants out of season, and growing them in a clean and profitable manner.

Soil-less culture consists of growing plants in solutions of chemicals which closely approximate in nature and concentration to those found in a good soil. The chemicals are easily obtained and the solution quickly made up, the only snag being that a fairly accurate balance is needed. A deficiency or excess of any one element soon shows itself, but can be remedied if one knows the symptoms that are to be expected from that element.

For containers I find that either two-lb. jam jars or the jars sold for preserving fruit are most suitable, all depending, of course, on the size of plant grown. A large root needs a large space! The solution needs a daily aeration and it must be changed at least once a month, as it becomes stale and lacking in elements.

I find this method best for growing plants used for young or small larvae, and for winter growth a small heating-coil is used. This winter, for instance, I have reared *Papilio perrhebus* from the Argentine, feeding on *Aristolochia*, with partial success. I find there are numerous difficulties which beset the winter rearer which I have not yet overcome.

When larvae are actually feeding on the growing plant, I use a zinc gauze cylinder, with a gauze base bored to receive the plant stem, and a muslin top. This is very satisfactory.

Finally, to my mind, the main advantage over growth in flower pots is that there is no fear of the plant dying from lack of moisture and no decay due to sour earth. The only things to guard against are algae, but if the containers are surrounded by cardboard, this is of no consequence as algae do not live in the dark.

I hope other members will try this method of growing food-plants to see how they fare, and perhaps let me know. If details of preparation of the solution are required, I will gladly supply them on receipt of a stamp.

C. J. TAYLOR (2055).

PUBLICITY AGAIN

The response to the request in last December's *Bulletin* for ideas on publicity was not extensive, but it was most useful and I hope members will try out the ideas. Mr. W. R. Smith (1641) sent a press cutting from a local paper consisting of a long article about Mr. Smith and his breeding of silkmoths with a photo. showing his jacket teeming with live imagines. This brought him enquiries from people whose interest had been aroused. It was a short step to the recruitment of new members to the Society. Exotic silkmoths are, of course, especially showy, but other members, including juniors, might try the idea with many colourful local species such as the hawkmoths and tigers. Why not rear a showy brood and take one or two specimens to the editor of your local paper, suggesting that he put on a reporter to "write you up"? Don't forget to tell the reporter that you will be pleased to discuss insects with anyone interested; and then talk about the AES.

Mr. W. J. B. Crotch (1181) did good work at his public library for some three years before leaving Kensington. He provided a breeding cage of silkmoth larvae which he attended to himself at first. Later, the staff got interested and took the job on. The larvae duly pupated and imagines appeared to the great interest of both these staff and the public. Enquiries were encouraged and new members were recruited to the AES. Puss Moth larvae would have been just as attractive.

Mr. Crotch had another good idea. He used the ordinary public library book request procedure to get them to stock copies of AES publications (in spite of the fact that his own name appeared on some as Editor!) This puts up sales and advertises the AES in addition to advancing the objects of our society.

I have written personally to members about one or two ingenious but impracticable ideas. So far, all the honour seems to have gone to the Silkmoth Group. Come on the rest!

L. W. Siggs (243).

(As Advertising Secretary: Mr. Siggs is this year's President.—Ed.)

YOUTH SECRETARYSHIP

It has been a rather unfortunate fact that whilst one of the chief aims of the Society has been to assist the younger entomologist, a glance through recent *Bulletins* has shown little correspondence from the office of the Youth Secretary. This has been partly caused by the Council's decision to appoint a junior member as a Youth Secretary—which at first blush appears to be an excellent idea. Experience has shown, however, that no sooner does a young member attend a few Council meetings in the capacity mentioned and begin to 'feel his feet', than he is either called away for National Service or starts a course of training for a career. The results are equally disastrous from the AES point of view.

To a young society like the AES, which relies on the younger people for its life-blood, it is essential that they be represented at the Council meetings by a Youth Secretary. This year I was elected to this office and look forward to representing our junior members on the Council.

I shall be pleased to hear from any of you who have suggestions or constructive criticisms regarding the Society from the point of view of a junior member.

S. M. Hanson (320).

A CHALLENGE TO JUNIOR MEMBERS

As a special incentive for younger members to observe, record and contribute to the *Bulletin*, the Council are willing for one issue to consist entirely of writings by junior members, if sufficient material of good quality be sent to the Editor.

All contributions for this issue should reach Mr. Crotch by the 12th September, so let us have your reports of observations, practical dodges, and experiences, accompanied by black ink drawings if needed. These should be twice the size they would appear if used in the *Bulletin*.

S. M. Hanson (320),
Youth Secretary.

LETTER TO THE EDITOR

Sir,—In the review of "The Young Field Naturalists' Guide" (p. 24), you mention "an unfortunate error on p. 72." Actually, it is not the mathematics that is wrong, but the use of the word "formalin."

It is 40% formaldehyde that is to be reduced and not 40% formalin. 40% formaldehyde is the most concentrated percentage supplied and does not become formalin until water has been added to it. When breaking formaldehyde down it is quite correct to treat it as "100% formalin," then the ratio of nine parts of water to one part formaldehyde to make 10% formalin is quite correct.—Yours faithfully, K. H. HYATT (1411).

First Supplement to the Indexed Check-list of the British Lepidoptera with the English Name of each of the 2,313 Species (1947), by I. R. P. Heslop, M.A., F.R.E.S. Published by E. W. Classey, Feltham, Middlesex, 1953. 1/9 post free.

This first supplement to the well-known Check-list by Mr. Heslop is reprinted from *The Entomologist's Gazette* and contains additions to the British List, announced to the end of 1951, bringing the total to 2,351 species. It is easy to criticise: and this list and supplement in several ways lend themselves very openly to criticism. It is, however, not my intention to do so unduly, but to congratulate Mr. Heslop very heartily on his list and supplement; for, apart from what some of us call excessive exuberance in including a number of very doubtful species, it can, at any rate, be considered as very complete and is the *only* British list which can be thus described.

I am not very favourably inclined towards English names for Microlepidoptera; the species are too numerous to make it a satisfactory proposition, for it necessitates the use of three and four words to describe many of them and a label list would be practically an impossibility, using such names. Of course, some of the combinations make a fair description of the species and are useful in that respect. But I am sure that the English names will never be generally adopted. One real gem is "Late-Summer Fruit Twist." Shades of "Barrow Boys"!

The supplement is in four sections devoted respectively to introduction, list of additions, amendments due to these additions, and a list of corrections to a number of minor typographical errors in the Check-list.

To those who already have Mr. Heslop's 1947 list, this supplement is a necessary addition and to those without the list and supplement my suggestion is they are indispensable to anyone wishing to have the only complete list of British Lepidoptera at hand.

As an acknowledgment to Mr. Heslop I would add: Stout work. Carry on! Your list is a necessity.

H. E. H.

Entomological sang-froid

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THE BULLETIN OF THE AMATEUR ENTOMOLOGISTS' SOCIETY

EDITED by W. J. B. CROTCH, M.A., A.K.C.

AES NOTICE

WHERE TO WRITE

Applications for new membership; offers to help with AES work: Exchange Notices to: E. Lewis, *8 Parry Road, London, S.E.25. (Wants and Exchanges Lists are circulated in March, May, July, and October and notices must be received by the 15th of the previous month.)*

Advertisers to: L. W. Siggs, *10 Repton Road, Orpington, Kent.*

Non-arrival of Bulletins *and changes of address should be reported to:* B. L. J. Byerley, *48 Elmgrove Road, Harrow, Middlesex.*

Offers to lead Field Meetings, exhibit, etc., to: K. H. Bobe, *19 Hengist Road, London, S.E.12.*

Manuscripts, drawings and books for review to: W. J. B. Crotch, **6 Balmoral Mansions, Clevedon Road, Twickenham, Middx.**

Subscriptions (12/- per annum, 6/- for Juniors) to: P. C. Le Masurier, *85 Warren Drive, Tolworth, Surrey.*

AES BULLETIN

No. 151

JULY 1953

SCIENTIFIC METHOD: A REPLY

Since I completed my series of articles on scientific method I have met with certain criticism which, for the most part, accuses me of excessive impersonalism and lack of imagination. But first of all, I would like to point out that these articles were intended to be a purely practical contribution to the ideas on scientific method which have been voiced at various times in the *Bulletin*. I was not intending to give the impression that an insect was only a machine after all; but for certain purposes of scientific research the insect may be regarded as a machine, and I maintain that I am perfectly justified in this view.

Mr. Brangham, in the January issue, gave us a picture of the research worker as a stupid old fool, getting his beard caught in his calculating machine and constantly arriving at misconceptions, whereas the "unscientific entomologist" strode happily through the world, unhampered by knowledge, and in fact a much wiser and sagacious fellow. As I am a research worker myself, much in the company of scientists, I find this idea rather curious. It is my experience that a strict discipline of mind does not, in fact, stultify the imagination, but rather stimulates it by giving it reality. It is always rather satisfying to feel that, however far-fetched an idea may sound, it can always, if necessary, be put to proof.

Mr. Brangham condemns the suggestion that one should ever put one's ideas to proof. To regard one's insects purely as things of beauty and of wonderfully intricate construction is a perfectly legitimate view, and such an attitude has its place in the field of natural philosophy; but it is quite wrong to suggest that it is the *only* proper one, and the scientific view is foolish and pedantic. I am quite sure that in his study of insects Mr. Brangham makes use of keys and text-books compiled by the patient research of scientists, in which case his condemnation of the scientific attitude is an inconsistency.

Dr. Fraser brings forward a similar point, in regarding as sophisticated and unrealistic any attempt to reduce living things to the level of such basic terms as chemistry, physics and mathematics. He contends that animals possess a mysterious " something" which must not be meddled with or speculated upon. However, even the properties of life itself are being probed by drawing analogies between a living cell and a steam engine, and applying extensions of the laws of thermodynamics!

The fact that cold, impersonal reasoning can be combined in the same person with the highest level of philosophical thought and appreciation of beauty is seen in most of the greatest scientists. To mention a few names of recent years — D'Arcy Thompson, Karl Pearson, Sir Gowland Hopkins, Sir Arthur Eddington, each had a wonderfully wide grasp of the application of his science to the general assemblage of natural phenomena, and yet when studying a specific problem each took it in isolation and impersonally reduced it to fundamental terms of physics, chemistry, and mathematics. In fact, Sir Arthur Eddington found it quite easy to combine his fundamental researches in that most awe-inspiring of natural sciences—astronomy, with a deep religious experience, as is well seen in his paper "Science and the Unseen World", read as the Swarthmore Lecture before the Yearly Meeting of the Society of Friends in 1929.

It is quite possible, and, indeed, a frequent occurrence, for a scientist to become so engrossed in minutiae as to lose sight of the beauty and wonderment of the phenomena which surround him. A butterfly or a flower ceases to be primarily a thing of beauty and becomes merely a name, or a specimen pinned in a cabinet. But surely this is up to the individual.

When one looks at the history of biology, one sees that up to about 1800 very little experimental work had been done. From then on some progress was made. In 1824 Prévost and Dumas showed that contact of eggs and sperms was the prelude to fertilisation. In 1838 and 1839 Schleiden and Schwann postulated that most plants and animals are composed of cells. As late as 1850 argu-

ments were still going on amongst the highest authorities on the subject of spontaneous generation. The science of genetics did not get under way until the beginning of this century.

It is, therefore, hardly surprising that many rather quaint ideas about living things still remain as a legacy from this not-so-distant past. Biology is passing the stage where it records details about the life histories and external appearance of plants and animals (that is to say the descriptive stage) and scientists are entering upon a stage of abstractions, theories and generalisations concerning life itself.

If we are to keep pace in our studies of entomology with the general progress of science, we must discard all these preconceived ideas that living things are something unique amongst the general assemblage of natural phenomena. Dr. Fraser asked me for a definition of life, so I will quote one of the best authorities of the present day, Professor J. Z. Young. "Life is characterised by activities and processes and by the particular molecules that are engaged. Different types of life involve different processes, and each sort of life therefore produces certain types of molecules and certain visible structures. Specification of these chemical and visible units that we can abstract from the living organism is at present our only means of studying the system as a whole."

P. L. Bradley (1360).

A COLEOPTERIST'S HANDBOOK

We are pleased to report that the response to our appeal for promises to buy copies of the next AES Handbook was very good, both from within and outside the membership of the Society. The Council has, accordingly, decided to go ahead with this venture.

If all goes well, "A Coleopterist's Handbook" may be available for Christmas. Please do not waste your money and ours in sending enquiries to the Publications Secretary or Editor. We shall announce when it is ready for distribution.

USEFUL OR NOT?

I often wonder how far useful hints recorded in the *Bulletin* by their inventors are actually adopted by other members and become part of their entomological routine.

I think it would be a good thing if those members who try out a new idea carefully and find it useful would write and give their results. To try a new thing is a bit of trouble. To write it up, having tried it, is still more trouble. But good ideas must be given their meed of praise for the general good.

For example:—

(a) In January 1949 (*Bulletin* **8**, 3) C. Renfrew (1507) recommended balsa wood for setting boards.

I adopted this idea at the time and it is a boon, especially for small moths and micros which require very small pins. Mr. Renfrew improved on the idea later, by getting block balsa wood cut to the right size, with a groove made by a rabbeting plane. He gave me some when I came to Jordan, and I would not be without them. In fact, I have had block balsa wood sent out and made many more. The sandpapering must be properly done. To enable the wings to slip up more easily, I stuck cellotape (Selotape) strips on the boards either side of the groove. This worked quite well in the winter, but in the summer, once or twice, a micro's wing stuck to the cellotape when being taken off the boards. I think that the adhesive had worked through a previous pin-hole. A dust over with talc powder before setting another lot on the same board might prevent this. This snag might not occur in the cooler climate of England.

(b) In April 1950, it was Mr. Renfrew again who described a "pin-cushion" (*Bulletin* **9**, 30). This proved very much worth while when I was doing my own setting and very easy. When unsetting I simply stuck the lill pins into a strip of balsa wood and they were ready to be picked up in the right position for the forceps, when required.

(c) In August 1951 (*Bulletin* **10**, 90) A. L. H. Townsend (1691) in an almost casual note at the end of a letter seems to have solved many of my relaxing difficulties. He recommended sawdust, water, naphthaline and creosote. Having no creosote, a few crystals of thymol seemed just as satisfactory. As, however, thymol

was so expensive here, I now use a drop of origanum oil, which is locally produced and which was given me as a sample. This has a little thymol in it with another phenol called carvacrol, and certainly keeps mould away from the specimens. Without it, mould appeared almost at once. Green moths fade if left in this relaxing tin for any length of time. Here in Jordan, I find that if imagines are left too long in the tin, brittleness of the legs develops, even though the wings can be put in place without difficulty. But, of course, specimens should never be left in the relaxing tin *too* long.

TREVOR TROUGHT (1373).

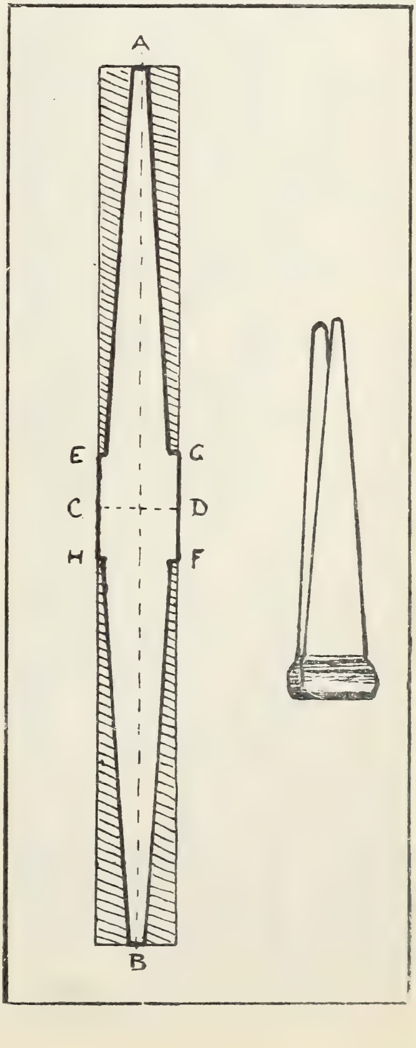
ANOTHER ACCESSORY

How do you take your insects out of the killing-bottle? Do you just up-end the bottle, and shoot them out in a shower of plaster-crumbs, and a mist of scale-dust? (This, of course, refers to Lepidoptera.) Or do you, perhaps, fish in the bottle with finger and thumb, haul them out one by one, brush the scale-dust off your fingers, and leave it at that? I hope you do not use either of these barbarous methods, but use forceps; for fingers and thumbs are definitely not good for Lepidopterous wings.

The ordinary steel forceps, in common use for handling pinned insects, are not really satisfactory for grasping unpinned ones, for the grooves and ridges in the jaws may easily break legs or antennae or even produce floppy, unwanted "ailerons" on wings. Forceps gentle enough to handle even the smallest butterflies and moths can be made in a few minutes. I have three of them, of different sizes, and find them exceedingly useful. They are cut from thin, springy brass, but fairly stout tin will do quite well. The largest, used chiefly for fishing insects out of the killing-bottle, is cut from a strip 9″ long by ¾″ wide. The medium one, very useful for holding the insect for pinning, needs a strip only 6″ by ¾″; and the smallest a strip 4½″ by ½″.

Exactly central lines, AB and CD, are scratched on the strip of metal, and the points E, G, F and H are also marked, half an inch on either side of the central line CD. Now cut away with the scissors, or tin-snips, the parts shown shaded in the sketch, leaving the ends A and B rather less than ⅛″ wide; and leaving the central portion, E G H F, the full width of the strip. (Note that the *length* of E H and G F, i.e., 1″, is the same in all three sizes of forceps.)

Lay the cut strip on the table, place an ordinary round pencil squarely across it, along the line CD; and then, holding the pencil firmly down with one hand, bend up the strip with the other so as to bring A and B exactly together. Hold them thus, and pinch the strip firmly and closely round the pencil. Remove the pencil, round off the tips A and B neatly with the scissors (holding them both together while you do this) and you will have spring-forceps so gentle that you can handle even very small moths



with the minimum of damage. Also, if you should drop them and step on them, they can be easily straightened out and made as good as new—which is far from being the case with steel forceps.

A. L. H. TOWNSEND (1691).

REARING THE SPURGE HAWK-MOTH

Ova of *D. euphorbiae* were obtained from a dealer last summer and fed from the start on Cypress Spurge. The young larvae were black in colour, with rather a short tail. They fed up rather slowly until the first moult, but afterwards were always ravenous. At each moult, the larvae became more and more bright in colour, yellow and white predominating on a black background. I had no trouble with them until the last instar. The larvae by this time were truly magnificent. They were mainly black, with red stripes and white and yellow spots and stars. No picture does justice to their colouring.

At this time, some trouble occurred in the rearing. I found that if a larva fell off its foodplant, it tended to remain at the foot of the plant, rather than climb back. If put back, it started feeding again, but often fell off once more. Whether I was just unlucky or whether this is a common habit, I cannot say. Further trouble occurred at pupation time. As some of the larvae fell to the ground, it was difficult to tell whether or not they were ready to " go down," and I am afraid one or two died of starvation as a consequence.

The larvae did better sleeved on growing food than on cut food, and they did not relish changing foodplant. This occurred when the supply of Cypress Spurge became rather low, and Petty Spurge had to be substituted. After a lot of wandering about, they finally consented to eat it. Nine pupae were eventually obtained, four of which emerged in October as a result of forcing, and five of which are lying over.

The moth itself lives up to the standard set by the larva, and is truly beautiful. The rose, brown and white wings and the brown and white fur harmonise very well. It is a pity that this lovely species is not more than a migrant to these shores.

C. J. TAYLOR (2055).

WORK ON THE ELEPHANT HAWK MOTH

Reference to Stainton's " Manual of Butterflies and Moths" will reveal that the range of the Elephant Hawk Moth, then styled *Chaerocampa elpenor*, was very well known even so long ago as 1854. Moreover it was regarded as common at most of the localities where Stainton's observers were resident, even abundant at Birkenhead and Scarborough, but absent from Darlington, Glasgow, Edinburgh, Oxford, Peterborough, Ramsgate, Winchester, Worcester and Worthing. Why these towns were avoided is difficult to guess, although it is possible that the omission was due more to the insect collectors than the insects. Meyrick in his Handbook of 1895 stated that *Deilephila elpenor* L. was common throughout England, infrequent in Scotland. South in "Moths of the British Isles", 1907, dismissed the species as "pretty common". It would seem then, that we are travelling on well trodden ground and that little more is to be learned about it. Some entomologists are apt to ignore all Lepidoptera as too much studied, but it is probable that there is still a great deal to be learned and said about even the commonest Macrolepidoptera. Many writers have stressed the importance of recording the effects of weather and vegetational changes on insect population. Dr. B. P. Beirne (*Ent. Gaz.*, Vol. 3, p. 174) has also stressed the need for co-ordination of these observations. He stated that work on even one species *might* be of great significance, the ultimate value depending upon the zeal, accuracy and honesty of the individual workers. Perhaps, under the circumstances, we should take all three for granted.

With all this in mind it was decided to begin work on the Elephant Hawk Moth, which is apparently eminently suited for our purpose. It is attractive to amateur entomologists (and they are the people who count in this project) it is common everywhere and it is easily found by the youngest tyro, at least in the larval stage. Moreover it is of a size which makes it good material for laboratory as well as field experiments. E. B. Poulton in " The Colours of Animals", 1890, p. 258, gives it an honourable mention. It is large enough to exhibit measurable individuality in its reactions to stimuli, ac-

customed or unfavourable, and so give proof that it is not a mere machine (thus retarding the development of a too materialistic outlook in the youthful observer—the modern tendency deplored by Lt.-Col. F. C. Fraser). Its fondness for a plant which will apparently grow on any type of soil in any locality is another point in its favour.

It seemed, therefore, a simple matter to set in operation an organisation for recording permanently the fluctuations in time and space of the selected insect, with a view to correlating incidence, abundance and ecological factors. The Geographical Provinces were worked out by Mr. Watson in his "Cybele Britannica", and, using these divisions, Mr. W. F. Kirby published in "The Entomologist's Weekly Intelligencer", No. 165, Nov. 26th, 1859, a thorough list of the divisions frequented by all the Sphingidae. This does not, however, give the *degree* of abundance or rarity, and this is the factor with which we are most concerned.

Accordingly a form was circulated in the Autumn of 1952 to a limited number of AES members, who indicated in the 1952 Membership List that they were interested in Lepidoptera. The names were chosen at random, but a "fair sample" was taken. The response was only lukewarm: 50% of those approached failed to reply at all. 30% apologised for negative replies. From the remainder it was possible to glean the information that *D. elpenor* L. was rare in the extreme North and South, common in the Midlands near industrial centres. The main question asked was "How many *elpenor* larvae did you find in 1952?" and that is the factor on which we intended to base our population density figures. Mr. D. Moore (1248) of Barnard Castle, Co. Durham, found none. However, Mr. N. V. Harwood (825) of Guisborough, N. Yorks., found 13 larvae. Members in the Midlands were lucky. Mr Green (2043) of the Wirral found 3, Mr. J. P. Savidge also of the Wirral found 0. Mr Kennedy (20) of Leeds had 3 brought to him. Master Skidmore (1705*) of Shaw, Lancs., found "about 20". Mr. W. Bilbie (1674) of Clay Cross, Derbyshire, found only 2, while Mr. J. H. Johnson (1040) of 2 miles away found 72. Miss B. Hopkins (827) of Kirton, Lincs., had 6 larvae taken to her for naming. Mr. Kearn (2100) of Wolverhampton found 6. Michael A. Cornes (2126) of Burton-on-Trent found 26. Mr. Ransom of Bury St. Edmund's, Mr. Chitty of Hastings, Mr. F. H. Lyon of Tiverton were unable to record seeing even 1 larva. Mr. A. P. Major (1117) searched for galls without noticing any *elpenor*. Mr. D. Heppell (1690) found 1 larva at Leysdon, Hants., but this was "stung" by some Tachinid fly and died.

These results are more or less haphazard and therefore of no scientific value whatever, but, with a few precautions, they might have had some scientific significance. In order to obtain this desirable objective I would, in all humility, suggest that members, who would like to help, should select an area, close enough to their residence to be easily observed, where willowherb flourishes. Having selected their locality then make a search of *exactly* one hour's duration during one evening in the last week of August and take every *elpenor* larva which they find. These larvae should be reared carefully and a note made of the percentage of those of green coloration, and those "stung" by parasites. Later on these discoveries should be sent to me for comparison with the other records.

If no larva is found in one hour, the searcher can continue until the time required to find one larva is discovered, then we have a chance to find out the degree of rarity in that area.

It will be seen that my aim is to put into practice many of the suggestions which are airily put forth by the men of thought. If we can devise a standard method for measuring the population density of one species of insect, we may be able to extend our survey further. For instance the Small Phoenix, *Ecliptoptera silaceata* Schiff., is often found with *D. elpenor*. Comparison of numbers of these two species in a season may reveal the needs of two widely differing species.

Some members of the group bred numbers of the larvae from eggs, mainly to investigate the dimorphism. Mr. Levett (1867) believes that in captivity the larva invariably assumes the brown coloration. John F. Reid (1823) believes that the degree of light to which the larva is exposed influences considerably the colour of its skin. They hope to continue their experiments this year. Mr. Levett also noticed that older larvae failed

to assume the "terrifying position". Were they becoming domesticated, that is had they "learned" that there was no danger in the cage? Reference to H. Spurway's article in "New "Biology", **13**, "Can Wild Animals be kept in captivity?" would suggest that they did. There are many other problems in behaviour which could be investigated. It is a good thing to duplicate experiments in widely separated areas, providing the results are pooled within a reasonable time.

Please let me emphasize that these are only suggestions. I welcome any comments or criticisms. Of course I should welcome even more any attempts to work the plan outlined and fill in the questionnaires which we hope to distribute later.

J. H. JOHNSON (1040).

APPARATUS FOR DRAWING

There appears to be a general need for a cheap and easily constructed piece of apparatus that will facilitate the drawing of the objects of our study. I have tried to meet this requirement with a simple camera lucida mounted on an adjustable wooden stand which when dismantled forms a neat carrying case. I hope the figures will help other members to make their own.

The camera lucida (A) consists of a cardboard tube some 4½″ long and of an internal diameter to take a simple lens (L) with a magnification approx. ×2. (In the model described a "Powerful Pocket Magnifier", 2/6 from a multiple store, was used. It has a diameter of 1⅝″ and magnifies ×2½.) The lens is fitted into one end of the tube and is retained in place by two cardboard rings.

At the other end of the tube, which is closed with a disc of card, a piece of thin glass (M) is placed in it at an angle of 45° and is fixed with plastic cement. This piece of glass may be rectangular and need not be shaped to fit the tube, but it *must* be fitted accurately at 45° to the length of the tube; otherwise all the drawings will be elongated. A microscope slide is excellent for this purpose; but some types of window glass reflect from both surfaces and produce a double image. Suitable glass may be obtained from any photographic stores.

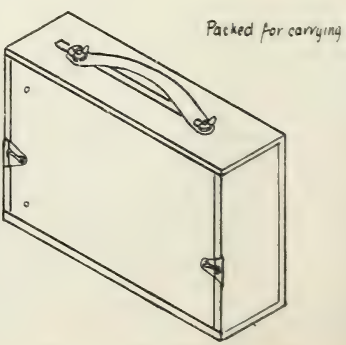
On opposite sides of the tube, holes (N) must be cut so that we may see fairly through the glass. The upper one need not be as large as the lower one (as the dotted lines in the diagram indicate): I made mine of 1″ and 1¼″ diam. respectively. The inside of the tube should be painted dead black or lined with black paper.

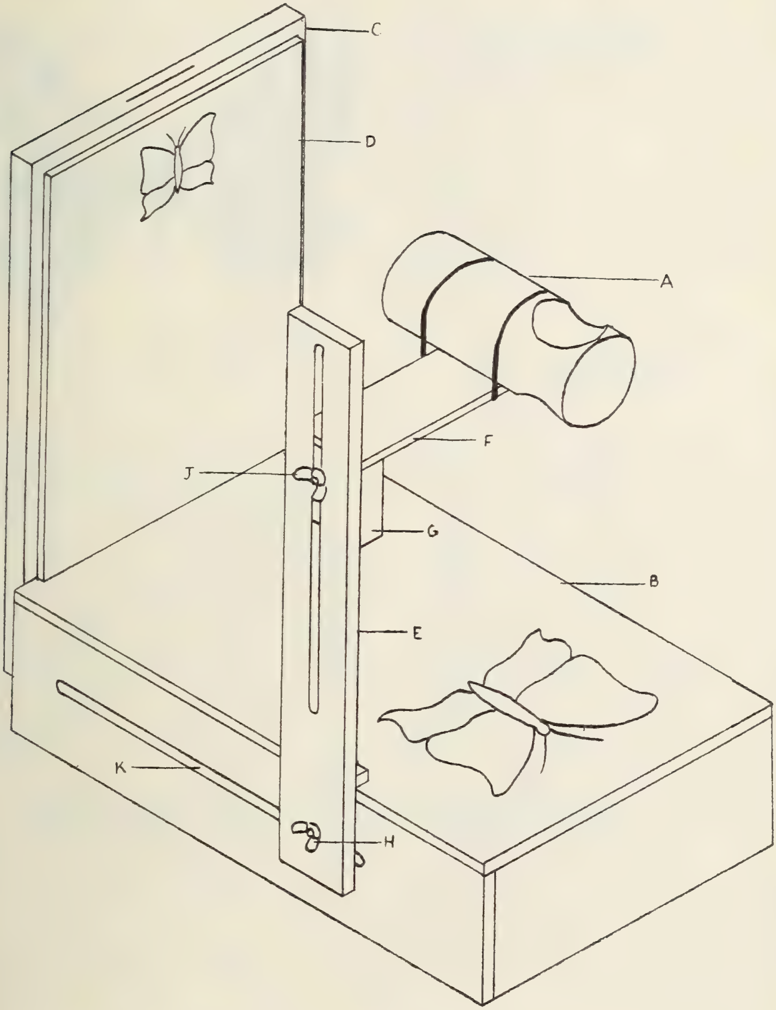
If a tube of the required diameter is not to hand, one may be constructed with brown paper and flour and water paste, which dries much harder than gum or glue and is much cleaner to handle.

The stand consists of a box (B) 7″ × 11″ and deep enough to take the camera lucida. A slot (K) ¼″ wide is cut out of one side to take a ¼″ × 1″ bolt fitted with a wing nut (H) which holds the adjustable upright (E). This upright (E), which is 10″ long, also has a ¼″ slot in which slides another bolt (J) carrying block (G). A piece of thin wood (F) 5″ × 1½″ is fixed to block (G) and carries the camera lucida which is secured with an elastic band.

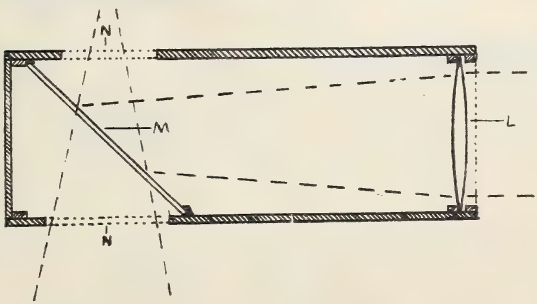
(C), which is actually the lid, is fixed when in use by means of two bolts through holes drilled in the end of the box. A sheet of cork (D) is stuck on one side of the lid and it is on here that the objects to be drawn are pinned.

The camera lucida is adjusted in height to bring it in line with the object by moving wing nut (J) along the slot in the upright (E) and is then focussed by sliding the upright along slot (K). Then on looking down through the holes in the camera lucida an enlarged image of the object may be seen on a sheet of paper placed beneath. If the light on the paper is adjusted carefully, the point of a pencil may also be seen on the paper and the image may be traced. It is essential that the light on the object and the paper be nicely adjusted, because if the object is too bright the pencil cannot be seen clearly.





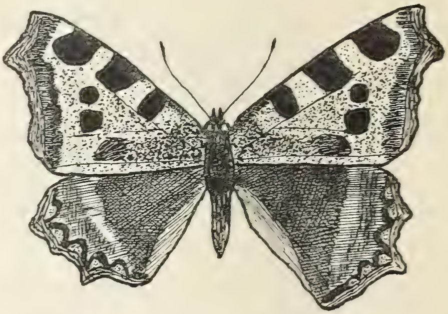
Section to Show Construction of Camera Lucida (A)



For transportation the camera lucida is removed from the carrier (F) and placed in the box together with the upright (E) with the carrier (F) still attached. The lid (C) fits *inside* the box and rests on bearers on each side of the box and may be fastened with a cabinet hook at each end, which must be counter-sunk flush with the edge of the box so that it stands flat when turned upside down. A very convenient handle may be made by fastening a leather strap between two of the bolts put through slot (K).

C. H. E. WILTSHIRE (2098).

AN ABERRATION OF WING CONTOUR



EXPANSE ~ 2 INS. D. HUTCHISON.

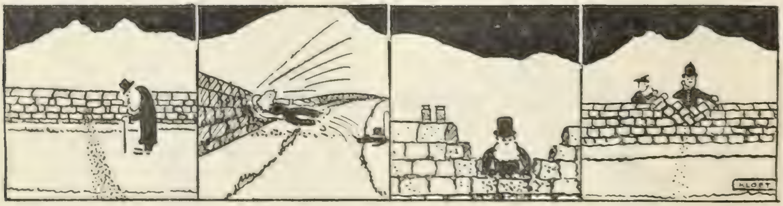
Amongst a number of butterflies in papers from the Himalayas, I have discovered a specimen of *Aglais cashmirensis* in which the margin of the left hindwing is completely different from that of the right. (See figure.) The species is closely allied to our own *A. urticae*, differing from that species in the duller colouration of the upperside and in the brown, rather than blackish, underside, but otherwise appearing very similar. The margin of the hindwing in this particular specimen is abruptly angled at almost 45 degrees to the body, after the apex, thus reducing the area of the wing by about one-third. The markings of the wing are normal in so far as the unusual shape allows. The row of submarginal blue lunules is intact, as are also the marginal markings and fringe. The wing is not crumpled or creased as one finds in cripples resulting from imperfect pupae and I noticed no peculiarity in the manner in which the wing was held when the insect was unset.

I have never before met with a similar case and I cannot recall ever having seen any reference to such a phenomenon in any of the standard works. The nearest parallel is, strangely enough, the specimen of *Aglais urticae* figured on Plate 29, fig. 1, of Ford's "Butterflies" and described therein on p. 229 as an example of Homoeosis. In that specimen there is a variation in marking and the asymmetrical appearance of the insect is not nearly so striking as in the case described above. It would be interesting to learn of any similar examples of structural aberration in the experience of other members.

I would add that the specimen is a male of the subspecies *aesis* and the data read: "Almora District, United Provinces, India: alt. 12,000 feet, 13/6/36." This altitude is not unusual for the species.

DAVID HUTCHISON (919).

Professor Fungus **By G. S. Kloet**



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VOL. 12
No. 152

UST - - 1953

THE BULLETIN OF THE AMATEUR ENTOMOLOGISTS' SOCIETY

EDITED by W. J. B. CROTCH, M.A., A.K.C.

AES NOTICE

WHERE TO WRITE

Membership applications, offers of help, Wants and Exchange notices (for March, May, July and October to be received by 15th of previous month) to: E. LEWIS, *8 Parry Road, London, S.E.15.*

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Youth matters to: S. M. HANSON, *167 Gunnersbury Park, London, W.5.*

AES BULLETIN

No. 152

AUGUST 1953

CATERPILLAR VIRUSES

[*The AES Council is indebted to Dr. Kenneth M. Smith, F.R.S., Director of the Agricultural Research Council's Plant Virus Research Unit, for this specially-written article.*]

In 1892 Iwanowsky, a Russian botanist, made a remarkable discovery. He found that when the sap of a tobacco plant, infected with the "mosaic disease," was passed under pressure through a special kind of filter which removed all living organisms, it still had the power of infecting healthy tobacco plants with mosaic disease. This was the first scientific proof of the existence of the ultra-microscopic viruses. Now, we know that viruses infect all kinds of living organisms from man to bacteria, including insects. We also know quite a lot about viruses and, by means of the electron microscope, we can photograph them and see what they look like. Their chief characteristics are their extremely small size (they are almost all beyond the resolving power of the optical microscope) and their apparent inability to multiply outside a living cell. Some of them are so small as to be almost of molecular size and a few of the plant viruses have even been crystallised.

There are three types of viruses which attack insects, mostly lepidopterous larvae: one type in which the blood and certain tissues become filled with many-sided (polyhedral) crystals (*fig. 1*); a second type in which there are no crystals but, instead, numerous granules; and a third type in which no inclusions can be observed in the cells. It is only with the first group, the polyhedral virus diseases, that we are concerned in this article.

These curious crystals, which incidentally are genuine crystals, have been known for many years and various suggestions as to their nature, all erroneous, have been made. At one time they were thought to be some

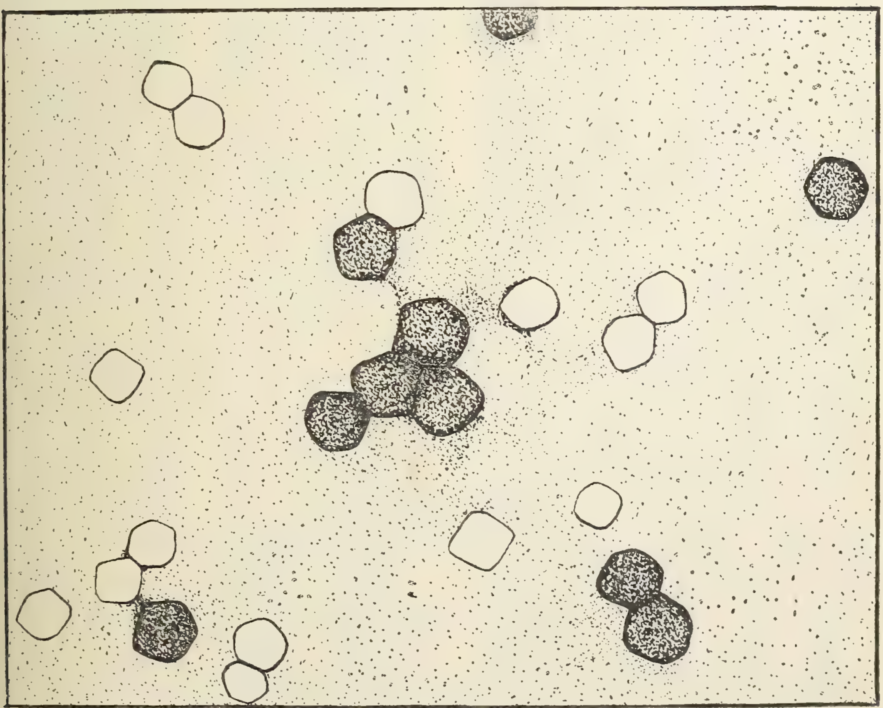

Figure 1. Drawn with 1/12″ objective, showing staining and non-staining polyhedral crystals. Circa × 1500.

kind of protozoa, and even classified as such; later they were considered to be crystalline aggregates of the virus itself. However, it was shown by Bergold in Germany, as recently as 1947, that the virus is contained within the crystals. If they are treated with weak sodium carbonate and then photographed on the electron microscope, the crystal itself will be seen to have dissolved, leaving behind it an outer membrane containing numbers of rods which are the actual virus particles (*fig. 2*).

Recently some further interesting discoveries have been made about the polyhedral diseases. The routine method of diagnosing a polyhedral disease is to make a smear of the blood and tissues of the caterpillar, stain it and examine it on the optical microscope, using a one twelfth oil immersion lens. (I give some further information on this process later). Under these conditions the polyhedra do not stain, but show up sharply against the stained background. However, whilst making a routine test of some diseased caterpillars of the privet hawk moth, (*Sphinx ligustri*), it was discovered that among the non-staining polyhedra were a number of polyhedra which had stained quite deeply (*again see fig. 1*). This discovery linked up with one or two other observations which have enlarged our knowledge of the polyhedral diseases considerably. When treated with sodium carbonate and observed on the electron microscope, these staining polyhedra presented an entirely different appearance from the non-staining type. There was no enclosing membrane and the crystal did not dissolve completely, but left behind a shell or ' honeycomb ' in which were many circular holes. In some cases, spherical particles, presumably the virus, could be seen, which had apparently come out of the holes in the crystal (*fig. 3*). We know, now, that there are two apparently distinct polyhedral viruses, each with its characteristic polyhedral crystal, shape and location in the tissues. Furthermore, whilst the non-staining polyhedra arise in the cell nuclei, the staining type arise in the cell cytoplasm and, as we have seen, both types occur together in the same caterpillar.

The second and third figures are from drawings, kindly made for me by my colleague Miss Margaret Short, of two photographs taken on the electron microscope of the two kinds of polyhedral crystals, shown in the first figure as seen under the optical microscope. The magnification is about × 25,000. Figure 2 represents the non-staining or nuclear type of polyhedral body, after treatment with weak alkali, showing the membrane which is left behind and the virus rods. Note that the rods occur in bundles and afterwards become separated; these are the actual infective agents which cause the disease. In this case the polyhedra came from an infected larva of *Abraxas grossulariata*, the currant moth. Figure 3 represents the cytoplasmic, or staining type of polyhedra, treated similarly to that in figure 2. Note that in this case there is no membrane, and that a shell or "honey comb" remains behind. The virus is spherical and is not rod-shaped as in the nuclear polyhedra; it came from an infected larva of *Arctia villica*, the cream spot tiger moth.

From this very brief description of the polyhedral viruses, I pass on to the more practical aspect of what can be done to prevent outbreaks of polyhedral disease in stocks of caterpillars. There are one or two fundamental points to be borne in mind. We have now considerable evidence that large numbers of the normal populations of caterpillars are already infected with virus, and this involves, of course, passage of the virus through the egg. This state of affairs is especially true of the tiger moths, the puss moth, the silkworm, and some of the tropical silk moths. It seems probable also that these *latent viruses*, as they are called, can be started up into multiplication (and thus cause disease) by certain adverse conditions, such as high humidity, low temperatures, possibly overcrowding and so on. I must also emphasise that although the polyhedral crystals are not the virus, they are nevertheless the means by which the virus is spread. These crystals are very resistant to external conditions and may retain the virus, which is contained inside them, in an infectious condition for two or three years. In nature the method of spread is for the caterpillar to eat foliage which is contaminated with the polyhedral crystals. These are dissolved by the alkaline secretions of the gut and the virus is liberated.

Infected caterpillars behave rather differently according to which of the two types of polyhedral disease is involved. In the nuclear or non-staining type of polyhedral infection, the onset of the disease is rapid and the caterpillar quickly dies in a characteristic manner. The skin becomes very

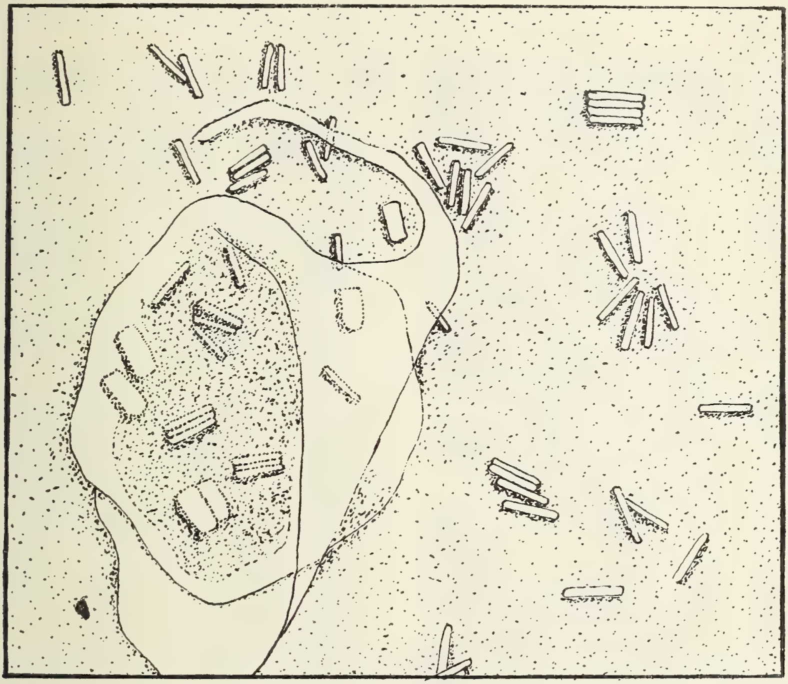

Figure 2. Drawing from photo. on electron microscope, showing dissolved polyhedral crystal and rod-like virus particles. C. × 25000.

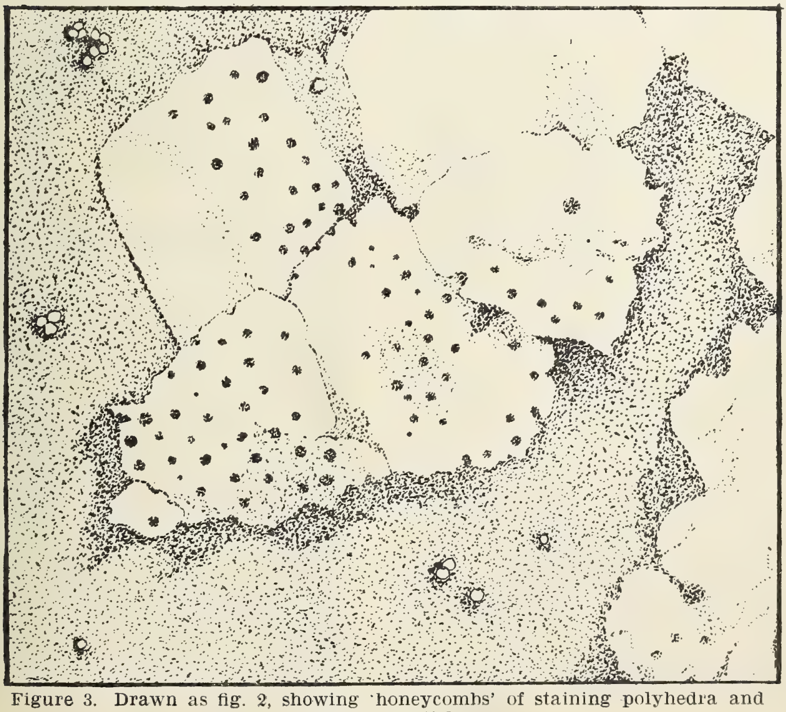

Figure 3. Drawn as fig. 2, showing 'honeycombs' of staining polyhedra and spherical particles.

thin and ruptures at a touch, liberating the liquefied contents of the body which now consist mainly of polyhedral bodies. These spread around and may easily contaminate the food plant and the cage containing the larvae; they also dry up and get carried about in the air.

With the cytoplasmic, or staining, type of polyhedra, the disease symptoms are less easily recognised. Affected larvae cease feeding and enter a static condition; they finally die without exhibiting any of the symptoms characteristic of the first type of disease. The skin does not rupture and the body contents do not become liquefied. Instead, the alimentary canal, usually the mid-gut, becomes white and friable and often enlarged because of the presence of many polyhedral bodies.

It is important, then, to realise that polyhedral diseases are intensely infectious and that the infective agents, the polyhedra, will hang around for a long time, probably a year or more. If the disease is suspected, the other caterpillars should be removed at once to a fresh container with fresh food, and the contaminated cage should be thoroughly disinfected. This can be done by means of dry heat, if the cage will stand up to it, and twenty minutes or half an hour in a fairly hot oven will suffice. An alternative method is to scrub out the cage with soap and hot water or strong soda water. Both polyhedra and virus are quickly destroyed by highly alkaline solutions.

The Editor suggested to me that AES members with microscopes would like a few details about the method of diagnosing the polyhedral diseases. It is really quite simple. Put the dead caterpillar on a clean microscope slide and, holding it with a pair of fine forceps, puncture the skin with a needle mounted in a handle. If the caterpillar is very dry, a small drop of water may be added. Smear the drop of fluid and its contents over one half of the slide, and dry thoroughly over a low flame of a bunsen burner or a spirit lamp. *Do not overheat.* Then put a drop or two of stain, methylene blue or Giemsa, on to the smear and leave for two or three minutes. Wash off excess of stain gently under the tap and dry once more over the flame. The slide is now ready for examination and a cover slip is not necessary. It is no use trying to diagnose the presence of polyhedra with any objective lower than the one-twelfth inch oil immersion lens. The crystals are too small for low powered objectives; and under the one-sixth inch lens many things look like polyhedra.

Broadly speaking, when caterpillars start dying in large numbers, there are two common reasons for their death. One is the presence of the polyhedral crystals which, with experience, can be fairly easily recognised. The other reason for death is the presence of large numbers of bacteria; they may be either rods or small spheres, or both, and incidentally they are usually present as secondary invaders with the polyhedral viruses.

Finally I should mention that members of the Amateur Entomologists' Society could help us in our studies of the virus diseases of insects by sending me the bodies of caterpillars or any kinds of insect larvae, which have died for no very obvious reason. They can be sent, just as they are, without preservative, preferably in a small tin box, to the Virus Research Unit, Molteno Institute, Downing Street, Cambridge. Acknowledgment, and diagnosis when possible, will be sent at the earliest opportunity—which may not be immediately.

SCHOOL NATURE STUDY UNION

The S.N.S.U. are to be congratulated on their Jubilee Exhibition held in London on 9th May. A large hall was well set out with exhibits from schools, training colleges and Natural History organisations as well as from publishers and natural history suppliers.

The schools showed a commendable tendency to specialise and to produce comprehensive and valuable contributions to the study of various aspects of nature, but a concentration on written work, with due attention to illustration, photographic and other, tended to produce monotony. After making every allowance for the difficulty of transporting living specimens, for the fact that schools have long holidays which interrupt the continuity so essential in breeding and maintaining living specimens, it was refreshing to come to the AES stall with its living insects, larvae and imagines. As usual, the Silk Moth Group's spectacular exhibits proved a special attraction and the stall appeared to be the most popular of the exhibition, being never without some interested spectators and often the centre of a crowd. There were numerous enquiries from teachers and

pupils. The AES members running the stall gave impetus to some useful recruiting by distributing free ova, larvae and imagines to likely recruits.

Other entomological exhibits were noticeably rare and this suggests that AES members might render a useful service to schools by providing them with live-stock. The breeding of living specimens is not only a way of enlisting the interest of the student, but is also a fundamentally sound basis for teaching natural history. Possibly this is a reason for the fact that many schools concentrate on botany. Teachers who neglect entomology—possibly through ignorance of its possibilities—are missing a fruitful field of education. We suggest that any member who knows a teacher interested in nature study should mention the fact that a school can become an affiliated member of the Society on payment of the adult member's annual subscription. This will help both teacher and Society.

The Editor would welcome the views of teachers who are already members of the AES on the various aspects of teaching entomology, both in class and individually. A collection of such articles might eventually form a useful addition to the Society's leaflets.

The AES leaflets were in great demand at the exhibition by teachers, who were loud in their praise of them as a teaching aid.

L. W. Siggs (243).

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OBSERVATIONS AND QUERIES

On 16th May I was walking through a wood in Kent where the Lady orchid (*Orchis purpurea*) is quite common, when I came upon a specimen with the flower-spike completely enmeshed in a cocoon, the flowers being drawn together by threads. In the centre of this cocoon a caterpillar (with orange-brown head and a completely hairless greyish-black body about an inch long) was either drilling through or eating away completely the *lips* of the flowers. When I cut the plant to examine it more closely, the caterpillar beat a backward retreat and dropped out of the cocoon into other vegetation where I lost it, and therefore could not breed it out. I wonder if any other AES member could inform me what this caterpillar was, as I am curious to know what moth would have the effrontery to attack such a lovely and rare orchid. Summerhayes ("Wild Orchids of Britain") mentions no enemy of this kind feeding upon orchids. Any information on this and other insects that feed upon orchids would be gratefully acknowledged.

Alan P. Major (1117).

Having read in the press of the recent plague of the Brown Tail larvae in the South, I should like to report what appears to me to be an abnormal number of Mottled Umber (*Hybernia defoliaria*) larvae in some of the Borrowdale (Lake District) woods this Whitsuntide. All kinds of trees were being defoliated, especially of course the oak. The larvae ranged from very small to quite large and to me the amazing fact was the large number appearing on the walls beneath the trees. I was glad to get out of the woods because of the curtain of suspended threads; and the falling of the larval droppings sounded like raindrops on the dried leaves. The female imago, being wingless, has, I presume, to climb the trunk in order to lay its eggs on the food-plant; but I would be interested to know why such a large number of the larvae return to the ground and, in their turn, are found climbing back again on the trunks to the foliage ("housing shortage" on this occasion might be the answer).

I have similarly been curious as to the transfer of the larvae of the Common Tiger moth (*Arctia caja*) from the trees to the ground, because I have found large batches of eggs on crab-apple and willow trees, although the larvae thrive principally on low foodplants. Upon emergence from the egg they appear to remain on the tree leaf. Do they then drop to the ground, where they remain during and after hibernation?

R. H. Benson (1444).

I believe that there is still some controversy about the use to which the earwig puts its "pincers". I have heard it suggested that it uses them to help fold its wings, or to assist in copulation.

The main use of its pincers is for defence! The other day I put my finger on the thorax of one and the pincers were at once arched over its back and dug into my finger. It took a vigorous shake of the hand to free me from its painful clutches.

I have since experimented and have definitely come to the conclusion that the pincers are primarily defence structures.

On the whole the earwig is a timid insect and will only fight if the latter is the last resort. If any other member has any other observations, I should be glad to read them.

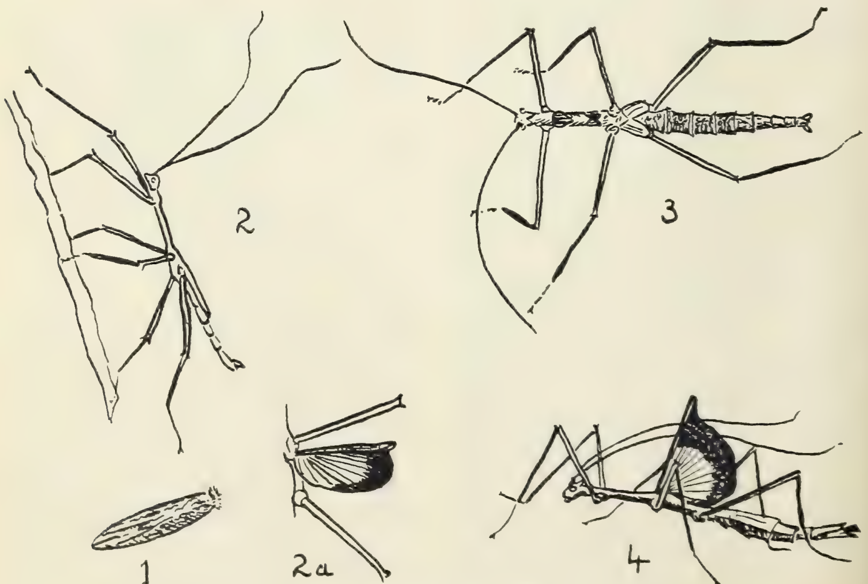
Nigel J. Austin (966).

THE JAVANESE STICK INSECT

Among the insects exhibited on the AES tables at the Jubilee Exhibition of the School Nature Study Union in May 1953, were imagines of the Phasmid, *Orxines macklotti*, the Javanese Stick Insect. Since ova were available and this is altogether more interesting than the stick insect, *Carausius morosus*, commonly reared in schools, I was asked for details about breeding it.

As will be seen from the figures (2, 3 and 4) *O. macklotti* is regularly bisexual* and both sexes have wings. Their foodplant is rhododendron and any species seems acceptable. The egg (fig. 1) is about 5 mm. long, crinkled, greyish brown, and very much like a seed with a winged corona, except that the little spikes do not bear the silky filaments of an airborne seed. It is dropped by the mature female at random on the surface of the soil, though beforehand it is often retained for quite a time nine-tenths extruded from her ovipositor. It is much easier to relieve her of the ovum than to search for it later on the cage bottom. Ova should be kept frost-free and should be moistened from time to time; but care must be taken not to induce mildew.

The imagines result from a normal series of moults and attain their full size fairly rapidly; but the wing buds develop slowly. In the initial stadia the insects, particularly the females, are patterned with whitish green irregular spots on a brown background and closely resemble lichenous bark. When the wings are fully grown, they are used as alarm signals (fig. 4). The females especially will suddenly raise their wings perpendicularly above the body when disturbed, snapping them closed and open again quickly. Since the colour is orange, bordered with white spots enhanced in brightness by the black which surrounds them, the action is startling to a human being—and presumably to a much smaller natural predator. Whether they are ever used for gliding flight is not known from my study of the insects confined in captivity. The male's wings (fig. 2a) are small even in relation to his lesser size. It is presumed that they cannot give effective true flight.



ORXINES MACKLOTTI

1, Ovum × 2. 2, Male imago × ½. 2a, right wing × ¾. 3, Immature female × ½. 4, Mature female with wings raised × ½.

The insects are charmingly eccentric to watch and handle. It seems that the eyes are not much used in connection with locomotion. The long fine antennae are moved, singly or in unison, through sweeping arcs (perhaps to sense obstructions or fresh food) and the forelegs are edged tentatively into the "unknown" until they find purchase. The most slender support will do, and the leg or antenna of another stick insect will provide a hold, so that a tangled pile of imagines can often be found in the breeding cage, making the occasional task of changing the foodplant a tricky process, if mutilations are to be avoided.

This standing on one another's legs is also a feature of the copulatory attitude. The male places his two leading pairs on the femora of the female's second and third pairs of legs. He grips her abdomen with his hind pair. Her abdomen is curved sharply upwards, while his makes a half-circle and effects conjunction from underneath. Since copulation takes place after nightfall, it is only the lucky switching on of a room light which may enable one to see a pairing.

The insects give off a heavy and sweet perfume when disturbed and this is picked up by one's skin if the insects are allowed to walk on one's hands. A female *macklotti* might well be a pleasing hair-ornament for a lady AES member going to a dance —and provide just a touch of scent behind the ears into the bargain.

They thrive in a cylinder cage, with little ventilation, in what may conveniently be described as a "kitchen climate." Falls of temperature to 40° F. can be tolerated, but they should not be left by a window through the winter. Their life-span is a little more than a year (ignoring the three to six months spent in the egg). They are not ravenous eaters and their frass is quite dry and rather aromatic. If a good sprig of rhododendron is placed in a water-jar in the cage, they may be left unattended for a fortnight—quite a consideration when one is going on holiday!

W. J. B. Crotch (1181).

*Whereas *C. morosus* is normally parthenogenetic and males are very rare. See *Bulletin* **11**, 18.

MEMBERSHIP

Mr. L. W. Siggs' note on membership (p. 47) and a letter from Mr. E. Lewis earlier in the year have combined to set me writing the few notes below.

I am a schoolteacher and encourage my pupils to take an active interest in Nature Study and especially in the insect kingdom. This encouragement takes the form of informal meetings of the school Field Club once a week throughout term time. At these meetings boys bring along their findings and captures and I do my best to give identifications, through necessity somewhat approximate, and some interesting information. If the boys happen to have brought nothing then I can usually produce some specimens to discuss. The AES is stressed as a valuable source of help and contacts with people of similar interests.

In the summer term coach trips are made to good localities, most of which are out of easy cycling reach of the junior members. The boys pay part cost of the coach and school funds pay the rest.

Sometime early in the autumn term my notice board and classroom doors were bedecked with the AES Prospectus, several Bulletin covers, a sample Bulletin, a membership form and a list of AES publications. Later on in the same term, I suggested that a useful Christmas present would be the cost of the AES junior membership and that the suggestion might profitably be passed on to aunts and uncles.

What results so far as the AES is concerned? My first campaign, in 1951, was timed a little too late; it appeared that 'present money' was already booked up. With better timing in 1952, six boys joined in January. I sent all the application forms up together (including a spelling mistake which brought down upon me some administrative frowns), thus causing Mr. Lewis to declare that this mass enrolment was a piece of AES history. Three other boys wanted to join, but their parents thought otherwise. One more lad joined a few weeks ago and an eighth has just asked for an enrolment form. Thus my campaign has produced seven, possibly eight, new members this year. The true results will be seen next year, when subscriptions have to be renewed. If all these lads renew, then I shall have been successful.

How about other schoolteacher members beating my figures?

R. S. George (1402).

REVIEWS

Butterfly Farmer by L. Hugh Newman. Pp. 208 with index; 68 plates, 9 line-drawings. Phoenix House, London, 1953. Price 16/-.

The author needs no introduction. This latest book of his is full of interesting reading, gives an insight into the methods of breeding and rearing insects in captivity, and throws light on some of the setbacks which one must expect to encounter when either breeding or attempting to establish a species in a new locality.

The book gives the history of the Butterfly Farm at Bexley, from its infancy until the present day, and describes many of Hugh Newman's experiences as well as those of his father, whom so many of us knew so well, especially in the auction rooms.

I feel that this publication will be of great assistance and interest to many, especially the younger entomologists and those who are hoping to breed their own specimens. It should fire the youngsters with enthusiasm to take the many risks of breeding insects.

The photographs are good. Those of Lord Rothschild and Tring bring memories to many of us, and those of the Butterfly Farm and breeding apparatus, etc., will give assistance to others.

This is a well written book and confidently recommended.

F. B

Nature's Way, by L. Hugh Newman and Walter J. C. Murray. 236 pp., 32 pp. photographs. Country Life Ltd. Price 25/-.

The form of this book will not please everyone, but it has much to recommend it. Each chapter deals with an aspect of the animal world from "Birth" to "Death," each section of a chapter being headed with a question which the section purports to answer. It is, of course, impossible to achieve this end in the space available. Even three pages allotted to "How do animals go courting?" leaves volumes unsaid. To some, these questions will be a little irritating and appear unnecessary.

To a discriminating reader who is approaching natural history anew, however, these questions will suggest many fields of investigation and one can imagine an adolescent, school work permitting, being encouraged to start on many a new field of exploration and discovery.

The more mature field naturalist will find that browsing among the questions will revive memories and start speculation which will provide entertainment for many a winter's evening. This book deserves a place on the bedside bookshelf.

The photographs are up to the high standard one expects in *Country Life* publications. The preponderance of entomological examples, both in the text and in the photographs will be an added recommendation for AES members.

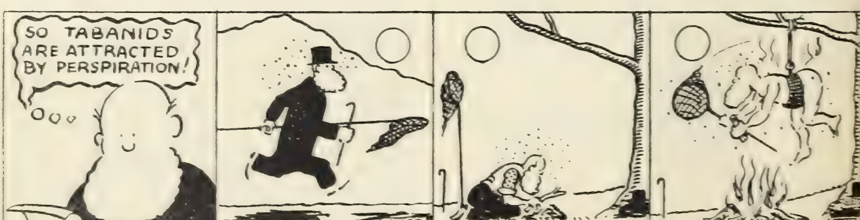
L. W. S.

PROFESSOR FUNGUS

Our members will, we are sure, be glad to know that Mr G. S. Kloet (Yes! He is the famous Kloet of "Kloet and Hincks") has drawn a whole new set of cartoons for us, which will figure as tailpieces to the *Bulletin* each month, unless space is just too tight to permit.

It is probably unnecessary to remind members (but all the Juniors may not know) that such drawings are copyright and neither the cartoons nor the idea of Professor Fungus may be used without permission.

Professor Fungus **By G. S. Kloet**



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The Amateur Entomologists' Society

ANNUAL EXHIBITION
1953

SATURDAY, 19th September, from 2 p.m. to 5.30 p.m. at **BUCKINGHAM GATE CENTRAL SCHOOLS,** Wilfred Street, London, S.W.1.

ADMISSION FREE.

EXHIBITS. The Hall will be open from 10 a.m. for receipt of Members' exhibits. Bring along your specimens (any Order, living or set), equipment, apparatus, photographs, drawings, etc. If you require a large space, notify Meetings Secretary in advance. Please label clearly.

TALKS.

(To be announced later.)

DEMONSTRATIONS. Members will demonstrate setting of coleoptera, diptera and lepidoptera, and the use of entomological equipment.

GROUPS. Members of Groups who have been corresponding will be able to meet for discussion.

OVERSEAS MEMBERS' EXHIBITS will be shown.

SURPLUS TABLE. If you have spare ova, larvae, imagines, equipment, books, etc., for sale or exchange, bring them along labelled with name, price, or exchange wants. No charge for use of this table.

ENTOMOLOGICAL TRADERS will be in attendance.

Offers of help and enquiries to Hon. Meetings Secretary (K. H. Bobe), 19 Hengist Road, London, S.E.12.

BRING YOUR FRIENDS AND AN EXHIBIT!

HOW TO GET THERE—

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EDITED by W. J. B. CROTCH, M.A., A.K.C.

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AES BULLETIN

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SEPTEMBER 1953

GENETICS BEHIND MIGRATION?

The Editor has invited me to give AES members the essence of a theory which I put forward in *Nature*, **169**, 832 (17.5.52). Of the many contentious issues which the phenomenon of migration in insects produces, I am here dealing with 'migration urge' only, not the theories of directional flight nor local dispersal due to overcrowding. I am trying to give some governing principle as to why such insects as *Colias croceus*, *Vanessa cardui* or *Macroglossa stellatarum* arrive here in this country, in greater or lesser numbers, year after year.

Up to date, environmental conditions, such as heat, drought, overcrowding, or the 'biological urge theory' of Heape[1], have been the sole claimants; but if environmental control alone were responsible, how great would be the loss of genetic material—for without a return, those individuals most fitted for endurance and flight would be lost for ever to the species. The painstaking observations of C. B. Williams[2] in this country, and more recently of D. and E. Lack[3] on a southerly migration of insects in the autumn, make possible a hypothetical interpretation of migration on a genetic basis for the first time. Environmental stimuli alone cannot be the sole cause, if only for the reasons that there are always individuals left behind which do not migrate; and that subsequent generations from the initial migrants, though bred in an entirely different environment, continue to migrate. This hypothesis may fit in with work already done on pupal diapause[4].

In 1947, I suggested[5] a possible theory of migration in insects on the following lines. In its simplest form there may be a gene for increased metabolic rate giving the individual a capacity for increased activity and migration (M), those individuals without it being m; the composition in the breeding area of, for example, *C. croceus*, at the beginning of the year would be MM, Mm and mm. MM individuals would be 'essential migrators,' those with a constitution mm would be physiologically incapable of migration (possibly due to absence of fat body), and Mm, the heterozygotes, would be at a greater advantage than either homozygote in being able to migrate or not according to the exact environmental conditions. In years when conditions were disadvantageous, all the heterozygotes (Mm) would migrate, but in other seasons when not so affected would remain non-migratory. In a 'migratory year,' succeeding generations passing north would inevitably increase their proportion of M, m's being left behind, while conditions of decreased heat and absence of drought would tend to hold back a proportion of the heterozygotes, Mm. Assuming that the average life-cycle of *C. croceus* is about thirty-five days at mid-summer, several generations might succeed one another between southern France and the Channel, by which time there must be a great increase in the proportion of essential migrators (MM). Towards the end of the summer, then, the gene frequency would show a cline from the north of England to the south of France with two homozygotes concentrated at opposing ends (M in the north and m in the south).

This suggestion was quite rightly criticized at the time on the grounds that there would be constant drainage of the gene M from its southern breeding grounds and that, as yet, there was insufficient evidence of a southern migration. In view of the recent observations, however, it would appear that there may be an autumn return of genotypes all along the cline towards their southerly breeding grounds, the more northerly returns containing a greater percentage of 'essential migrators' (MM) and finally meeting non-migrators (mm) who will have remained as such throughout the summer in reduced numbers. Between October and March at least one generation will appear of *C. croceus* (where there is no diapause), the heterozygotes of which would have no urge to migrate during the cooler months. It must be emphasized that this situation could only hold good so long as the hetero-

zygotes held an advantage over both homozygotes for a majority of the time. This theory fits in with known facts: (1) that migration in vast numbers takes place in certain years only (*MM* and *Mm*); (2) that even in ' non-migratory ' years certain individuals are seen migrating north (*MM*); (3) that there are always individuals which remain in the southern region no matter what the conditions (*mm*).

W. Hovanitz[6] has shown that in *Colias eurytheme* a single sex-linked autosomal gene (also controlling colour) is responsible for a change in activity. In the earlier part of the day (and to a lesser extent also in the latter part), this mutant flew in a greater proportion than did the typical. The idea of a genetic control of activity in the Lepidoptera is therefore not altogether new. It is not inappropriate to reflect at this stage, therefore, on the control of the pupal period in continuous brooded migrants by possibly the same gene conferring increased metabolism and activity in the adult. *Heliothis peltigera* is a well-known species migrating to Great Britain, the pupae of which (from wild larvae collected here) have been shown to fall into three categories in regard to habit and aestivation: essential aestivators, essential hatchers, and the majority, while capable of undertaking aestivation, nevertheless reacting according to the environment[4]. Jarvis[7] has shown a similar state of affairs in the pupae of *Pieris brassicae*. It is possible that the same gene which controls metabolism and migration might also control metabolism of pupal hatching and diapause. In this case the following situation would be found:—

IMAGO

MM Essential migrators.
Mm Capable of migration or not; environmentally controlled.
mm Incapable of migration.

PUPA

MM Essential hatchers.
Mm Capable of hatching or not; environmentally controlled.
mm Essential aestivators.

Proof of this hypothesis, still unconfirmed, might lead to its application in the realm of pest-control in the following ways:—(1) by attacking returning individuals outside their reservoir of breeding, thereby eliminating those homozygote to migration (*MM*); (2) by encouraging those individuals with the formula *mm* (non - migratory); great damage might, in fact, be done by elimination or reduction of these.

H. B. D. KETTLEWELL (706).

1 Heape, W., 'Emigration, Migration and Nomadism' (Cambridge, 1931).
2 Williams, C. B., *Trans. Roy. Ent. Soc. Lond.*, **42**, 240 (1942); *J. Animal Ecol.*, **20**, 180 (1951).
3 Lack, D., and Lack, E., *J. Animal Ecol.*, **20**, 63 (1951).
4 Kettlewell, H. B. D., *Proc. Trans. S. Lond. Ent. Nat. Hist. Soc.*, 1943-44, **69** (1944).
5 Kettlewell, H. B. D., *Proc. Roy. Ent. Soc. Lond.*, C **12**, 43 (1947).
6 Hovanitz, W., Contr. Lab. Vert. Biol. Univ. Mich. No. 41 (1948).
7 Jarvis, F. V. L., *Proc. Trans. S. Lond. Ent. Nat. Hist. Soc.*, 1941-42, pt. 1, 1 (1941)

ANTENNA-BRUSH?

On page 28 of the April *Bulletin*, the question is asked whether the brush-like process on the fore-tibia of *Plusia gamma* has been noticed in other species of the genus. I think it probably occurs in all of them. Certainly a similar form of it is present in each of the 16 Kenya species in my collection, and also in one species (*P. ni*) which is found in both Kenya and England. So far as I know, no-one has yet discovered what the use of this tibial process may be to the insect. To the student, however, it is of great use as a generic character; occurring as it does in a great number of moth-families and genera.

It is not by any means always clothed in hairs; though in some genera it is a far more hirsute affair than in *Plusia*. In one Noctuid, for instance, (*Sphingomorpha chlorea*), both the brush-process and the tibia itself are so thickly covered that, when the fore-legs are advanced, and the hairs spread, the insect's head appears almost as a small dot in the middle of a huge bush of long blond hair whose area is almost equal to the size of the moth's thorax.

Where the process is hairy, it is a very natural guess that it may be used for antenna-cleaning. But it is often merely scaled, and in many cases it is a hard, naked affair which, with the tibia to which it is attached, resembles a pocket-knife with the blade

slightly open: the tibia representing the handle, and the process the blade. Moreover, the process often fits into a groove in the tibia, as does the blade into the handle of a knife when shut. It varies greatly in length in different genera, being very short in some, and in others longer than the tibia itself. In the Genus *Onychipodia* (one of the "footmen") and in some others, it takes the form of a short hook; horny, curved and very sharply pointed. In none of these latter forms does it seem to be a very useful instrument for antenna-cleaning; though it is of course quite possible that it may be so used.

Tibial brushes are not found only on the fore-leg. A brush frequently occurs on the hind-tibia; and when this is so, there is usually a sort of spike or spine opposite to it on the side of the abdomen, which—again a guess—may perhaps be used to clean the brush itself.

A. L. H. TOWNSEND (1691).

Some of the Saturniidae have the horny knife-blade affairs, e.g. *Antheraea roylei*, which also has a conspicuously bushy pair of front tibiae. I have watched the males brush their antennae with their forelegs many times, but never seen with certainty how the projection is used.—ED.

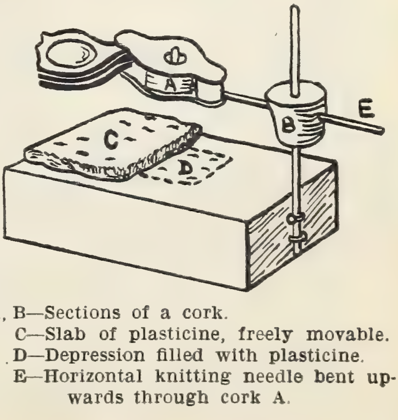
BEETLE SETTING

Mr Prevett's note in the November 1952 issue (*Bulletin*, **11**, 104) on the setting of beetles has made me wish to put in a plea for pinning as a routine method of setting. I remember discussing the matter some years ago with the late Dr. K. G. Blair, who said that while all that the museums required was that beetles should be gummed on to the turned-down point of a triangle of card-board, he thought that for ordinary collectors pinning was the best method and was the usual continental way.

In my English collection I gummed all but the very large specimens flat on cards, but since I came out to S. Africa I have pinned all but the very small and fragile ones. I can insert a pin through an Apion, but doubt if I should try with a Pselaphid!

I use only stainless steel, headless pins. For the actual pinning I find a slab of plasticine most useful. I use one about two inches square by half an inch thick; into this slab I make a groove with the handle of the forceps suited to the size of the beetle to be mounted. The beetle is placed ventral side downwards in this groove and held in position by holding a setting needle flat across it while the pin is inserted through the right elytron. After a little practice it is quite easy so to insert the pin that it comes out between the second and third legs without touching either coxa or damaging the centre line. The insect is then reversed and the other end of the pin pushed into the plasticine until its back is firm against it, when the antennae and legs can easily be spread into position. I then usually leave it in this reversed position, on another slab of plasticine, under cover (a glass tumbler) for twenty-four hours as, if left with the back uppermost, the legs tend to fall downwards. One small practical point, which applies particularly to Lamellicornia: I often find that after death the forelegs spread out at right angles to the body and cannot be moved forward into a more natural position; if, however, each foreleg is brought inwards across the centre of the thorax it will then go forward quite easily from that position. When the very fine pins are used, they must, of course, be mounted in polyporus strips.

All but large beetles I set under a home-made setting microscope, as sketched, which may be of interest to beginners. It requires a block of wood roughly 6 by 3 by 2½ ins., two steel knitting needles, a pocket folding lens and two halves of a bottle cork. My own lens happens to be a triple one; but since all three lenses together give too short a focus under which to manipulate the pins, I usually push one of them out of the way.



A, B—Sections of a cork.
C—Slab of plasticine, freely movable.
D—Depression filled with plasticine.
E—Horizontal knitting needle bent upwards through cork A.

As I have mentioned I still gum very tiny ones. For this I have made a depression about 1½ ins. by 1 in. a ¼ in. deep in the centre of the block of wood. This depression is filled with plasticine and the whole upper surface of the block is then covered with a sheet of blotting paper pasted over it; I use this in preference to ordinary paper as the beetles do not slide about on it. The piece of card is pinned through into the plasticine in the depression and thus held firm for the gumming of the insect under the lens.

A. H. NEWTON (1140).

COMMENT:—Very few British coleopterists pin (British) beetles except, perhaps, for some of the larger species, such as *Lucanus*, which are apt to break loose from a card. The following are some of their reasons:—

1. Many species are too small to be pinned; e.g. *Acrotrichis, Ptilium, Euthia*.
2. The pin is apt to deform the specimen or to hide some of the diagnostic characters.
3. Pinned specimens are usually much more difficult to examine and name than are carded specimens; this particularly applies to a comparison of the joints of the antennae which are apt to bend out of the flat field of the lens.
4. One grows accustomed to the general facies of a beetle when it is carded and thus it is more quickly recognised.
5. The fine pins are very apt to bend.
6. When beetles dry, they grow more and more brittle and so portions are prone to break away and be lost; in carded specimens they would probably remain on the card.
7. Dissections of genitalia can be gummed on the card and so more easily preserved.

Other reasons of less moment are that a collection of carded specimens has a neater appearance than one of pinned examples—and that collectors (the great majority) who card their beetles are unwilling to exchange with those who pin them.

G. B. WALSH (24).

WINTER REARING OF TROPICAL SATURNIIDAE

Looking back, I suppose it was the winter rearing of *Philosamia cynthia ricini* that first created in me the desire to have full rather than empty cages during the winter months.

The success of this effort made me think of the possibility of trying the same thing with other species that were not essentially single brooded. *Actias selene* was the first that came to my mind, as the emergences were regular enough to be fairly sure of pairings during the summer and autumn, but after overwintering the general tendency was for them to be so irregular that pairings were often very difficult. This fact seemed to indicate that the natural tendency of the moth was to be more or less continuously brooded and that the artificial conditions created in order to delay the emergence until the spring were responsible for upsetting the rhythm of emergence. The problem to be solved seemed merely that of finding a suitable evergreen foodplant.

My first effort with *selene* failed before it had started: for while there was the opportunity for pairing and the conditions were apparently suitable, the moths refused to pair.

The following year young larvae from a very late pairing of *Nudaurelia tyrrhea*, whose parents had been reared on apple, were persuaded to accept Portugal Laurel. At first they seemed to do just as well as those that had been reared on apple, but after the first moult casualties were heavy. Quite a few reached the second moult, but from then on growth ceased, although feeding continued, and none reached the third moult.

Cricula andrei larvae, hatched out during October, started off very well on Holly and seemed to be well established, but they too suddenly stopped growing and died as if from starvation.

A further effort with *A. selene* was made in 1952. Some 300 larvae were persuaded to accept Holly, Portugal Laurel, and Rhododendron. A few larvae had been reared successfully on Holly during the summer. The result was the same as before. The Holly group were the first to die. Those on Rhododendron seemed to make rather better progress than those on Portugal laurel, but once again disaster followed the first moult. In this case a number of each group did complete the third moult, but only one, which was being reared on Portugal Laurel, reached the fourth

and final moult. This sole survivor died when the moult was half complete.

A botanist colleague of mine supplied the answer that should have been quite obvious from the start. Many of the evergreens, if not all, although retaining their leaves during the winter, ceased to draw up sap in the autumn and do not start again until the spring. The young larvae had in fact been starved to death through lack of nutriment in the food provided.

The sugar feeding experiment reported in the February 1953 *Bulletin* (p. 9) suggested the possibility of providing the necessary additions to an unsuitable diet in an artificial way.

With cages once again empty, it was possible for me to devote many of the long winter evenings to reading up the subject of Diet and Nutrition. After careful study of the works of Wigglesworth, Brues and Uvarov, I found that natural sugars provided energy but would not provide growth, although they could support life for a time after growth was complete. Growth and powers of reproduction were stimulated through the digestive assimilation of various substances of the vitamin B group and nitrogenous matter.

In the initial stages dextrose was used as a source of natural sugar, potassium nitrate as a source of nitrogen and marmite provided the vitamin B requirements. There are a number of products on the market which contain several of the more important vitamin B substances required, i.e., thiamin, aneurin, riboflavin, nicotinic acid, pantothenic acid and insitol, to mention a few. It is probable that almost any one of these products would prove satisfactory. Actually after a few days I substituted brewer's yeast for marmite.

Although it seemed from what I had read that a solution of these substances might be effective, I could find no clue regarding the strength of such a solution nor the proportions of the ingredients to each other.

The following was therefore a shot in the dark, hoping for the best.

Dextrose	2 tablespoons
Potassium nitrate	1½ tea-spoons
Marmite	½ tea-spoon
Water	1½ pints

Later, two tablets of brewer's yeast replaced the marmite and, as the larvae grew, the proportion of water was reduced to 1 pint.

When a pairing of *Antheraea pernyi* was obtained early in March, the opportunity for putting this solution to the test was provided.

The ova were the third domesticated generation to my knowledge, and I should want a lot of convincing that the original ova that I purchased had been laid by wild stock. It was not surprising therefore that only approximately 60% of the ova hatched and that about a further 20% died within a day or two of hatching. This, I submit, may be taken as a sign that the stock used for the experiment was not of the strongest.

The larvae are normally reared on oak and the only type in leaf so early in the year is the evergreen oak (*Quercus ilex*). The leaves were hard and dry and I should imagine anything but appetising. A dozen larvae were given normal evergreen oak without vitamin solution. Although they fed quite vigorously, they seemed to derive little benefit and were all dead within a week. I had expected that this would happen, but the test was considered necessary in order to prove the inadequacy of untreated food. The remaining larvae were given the same food, but the backs of the leaves were painted with the solution. As time went on the job of painting the leaves became too laborious and the solution was sprayed on. The larvae had no hesitation in eating the 'doped' food and progress throughout remained normal and steady. When fully grown the larvae were fat and healthy in appearance and I am inclined to think rather larger than normal. Thus far the object of the experiment had been achieved.

When the moths emerged they were well up to standard, the wing spans averaging 4″ to 5″ in the males and 4½″ to 5½″ in the females. What was more pleasing was the fat sleekness of the bodies and the heavy scaling of the wings. Pairings were readily obtained, but *pernyi* is never difficult. Apart from one pair that remained together for something approaching 48 hours, the duration of pairings was about 22 hours.

Six pairings produced between 130 and 150 ova each. So far as could be judged without actually counting through the empty egg shells, there was 100% hatching in each case, or at least something very near it. Up to one week from the time of hatching not one single death from natural causes had taken place, although the normal oak on which they were fed

was 'undoped'. What, therefore, may be claimed as the result of the experiment? Certainly, I think, that it provided the nutriment for rearing. There seems justification too for thinking that it may have re-vitalised the strain. If this be so, then I think we must re-consider our ideas regarding the rapid deterioration of some species bred in this country as the result of inbreeding.

In summing up, may I suggest that this can do no more than provide a useful starting point for a long series of experiments? For example, we do not know how the solution will suit other types of larvae, nor whether its use with normal summer foods will tend to produce super-imagines or prove so rich that the larvae are lost. The composition of the solution was a haphazard guess, so that much has to be done in order to find out what proportions and strength produce the best results. Then, too, this may need to be varied for different species. If members feel disposed to try experiments on similar lines, whether with silk moths or other native genera and would care to send me a report of their findings, I will undertake to summarise the results from time to time so that all may benefit. I think members will agree that the task of putting the idea of enriching the food artificially to a thorough test is too big for one individual to tackle alone.

If any members wishing to try a similar experiment feel that they would like more information on any particular point, I shall be happy to give what help I can, but please remember that I am still groping in the dark.

W. R. Smith (1641).

Comment:—I warmly applaud Mr. Smith's pioneering spirit, but I feel that he has been led astray somewhere in respect of the make-up of his solution. It is almost certain that Lepidopterous larvae do not have in the gut any bacteria which could synthesise proteins from potassium nitrate: they certainly could not do it themselves directly. It may be that bacteria develop in the solution when on the leaf and so make a little of the nitrogen available to the caterpillar. However, protein is in the leaf even in winter and the yeast would provide some extra. I suggest that members should follow up Mr. Smith's plan, but without the nitrate in the solution. It should be just as effective.

T. R. E. Southwood (1051).

THE SWALLOWTAIL BUTTERFLY

It is feared that *Papilio machaon* has disappeared from Wicken Fen, as only three were seen last year and none this. It therefore appears that fresh British stock may have to be introduced to the Fen and if pure Wicken *machaon* could be obtained it would be better than having to release Norfolk stock. At the request of the Hon. Secretary of the Wicken Fen Local Committee, I am therefore asking anyone who has kept pure Wicken stock going to be so good as to contact me with a view to being able to breed up numbers for subsequent release.

H. B. D. Kettlewell (706).

REVIEW

The Social Insects by O. W. Richards, D.Sc., M.A. Pp. 219, with 129 plates and 12 line drawings in the text. Macdonald, London, 1953. Price 15/-.

The very considerable progress which has been made in our knowledge of this subject in recent years, makes an account by so distinguished an entomologist indeed most welcome.

The opening chapter introduces the reader to insects and their lives, followed by up-to-date descriptions of all the main types of social insects, which includes the various groups of wasps, bees, ants and termites. The descriptions, which mention some of the most recent researches, are in sufficient detail to give a good picture of these creatures' social lives so far as known, while many problems and gaps in our knowledge are pointed out or discussed. Entirely absent is a failing all too common with some of the writers on this subject in the past—that of judging insects by standards of human conduct and emotions. The style is clear and simple, technical terms being avoided throughout, making for easy reading. The numerous illustrations include some particularly excellent photographs.

Some readers will regret the absence of a reference list. This is partially compensated for in the text by the frequent mention of investigators' names; and at the end a list of eleven works for further reading is given.

While not written primarily for the entomologist, there can be few who will not receive both instruction and enjoyment from this fascinating volume. It should have a special appeal to AES members, for there is here still, as Dr. Richards emphasizes, a very wide scope for future study.

K. M. W.

EUROPEAN MIGRATION STUDIES

The Centre for the observation of butterfly and moth migration in Europe (see *Bulletin* **10**, 25) suffered a very grave blow by the death of that great enthusiast, Dr. R. Loeliger. The Editor is however glad to report the receipt, after an interval of some six months, of a further duplicated Circular (Number 41, May, 1953). Members may wish to note that the work is being carried on by Messrs. Eugen Pleisch and Hans Sidler, the address of the latter being Goldregenweg 21, Zürich 50.

JUNIOR MEMBERS' ISSUE

The Editor tells me that he has already received some very good contributions from Junior Members. Will you others please remember my challenge on p. 47—and that the date that matters is September 12th.

S. M. Hanson (320),
Youth Secretary.

ON BOOK REVIEWS

The Editor's note (pp. 39-40) evoked a good response from members and he would have liked to publish letters in support of both sides of the case. As it turned out, the views expressed were nearly all on one side. Four letters have been selected for publication. Will other members who wrote please accept his thanks for their interest?

From Mr. John Moore (146):—

May a professional writer and reviewer (though not as a rule of natural history books) offer a comment upon your sensible note, "On Book Reviews." Mr. Bickerstaff, with the kindliest intentions I am sure, really is talking through his hat. The purpose of a review is to tell the public what kind of a book X has written; to point out any particular merits or faults; to pronounce it good, bad or indifferent. The reviewer has an obligation (of complete honesty) to his editor and his readers. Anybody who publishes a book deserves and *expects* fair comment upon it, which may, of course, be favourable or otherwise. Mr. Newman himself, as a professional author, naturally realizes this.

The AES is *not* a mutual admiration society ; and Mr. Bickerstaff unknowingly would do a great disservice both to the Society and to the cause of science if he could persuade it to become one. I have, however, one suggestion to make. There is little value in anonymity, and the semi-anonymity of initials is rather pointless. A criticism, I feel, should always be signed by its author's real name.

[*The use of initials is often space-saving.*—Ed.]

From Mr. H. K. Airy Shaw (545):—

You invite comments on the review question. I certainly share your view that reviews should be factual and objective, and quite without "respect of persons." If authors and publishers take the risk of making books public, they should certainly be prepared for the frank public expression of opinion on them also. A.E.H.'s review of Newman's book seemed to me (without having seen the book) to be a perfectly fair and reasonable criticism, such as the society and the public are perfectly entitled to expect, if only to safeguard them from buying a "pig in a poke." And, after all, authors and publishers have a *responsibility* to the public, when they publish things, to see that their products are neither slipshod nor misleading, and it seems altogether right that they should be kept up to it.

One could easily draw up a list of requirements for an ideal book review. These might include:—(1) summary of contents; (2) does the book come up to reasonable expectations, in view of reputation (if any!) of author and publisher?; (3) is it good value for money?; (4) is the title apt, or misleading?; (5) is production good?; (6) is information accurate and up to date?; (7) was the book

really worth publishing?—all, of course, in the opinion of the reviewer. It might almost be worth drawing up a list, after careful consultation with a number of reasonable and reliable folk, and sending out a copy with each book, " for the guidance of reviewers."

[*I fear this might lead to reviews becoming rather stereotyped.*—Ed.]

From Mr. H. B. Sargent (1189): —

No, sir, members do *not* deserve the sort of review suggested in your closing paragraph. As one of those who live "removed from large centres of population where they could browse round well-stocked bookshops to handle the book and make a personal judgment of its interest or usefulness to them", I read AES Book Reviews with great attention. Unless they are a frank assessment of the value of the work concerned, your readers will find themselves either missing something they want, or buying something they don't want. When this happens, the space now given to this subject can be turned to more profitable use.

The important thing, I think, is that we should be given some guidance as to the standard of scholarship of the books; whether they are of the 'Picture Book' class, or written for the average collector, or intended for the advanced student.

"Is it likely there will be anything in it I do not already know? Do the illustrations cover fresh ground, or are they no better or more informative than those I already have in a dozen other books?" A good reviewer, I humbly submit, will supply us with the answers to these questions. There are other matters to be considered, of course; the attention of potential purchasers should be drawn to inaccuracies, and dogmatic statements should be carefully examined, and not allowed to pass unquestioned unless supported by the best authorities.

So, sir, I raise my voice in favour of full, free, frank and fair criticisms.

From Mr. T. H. C. Bartrop (1858): —

Your article, "On Book Reviews," will be sure to draw correspondence. My own reaction is to give some support to each point of view.

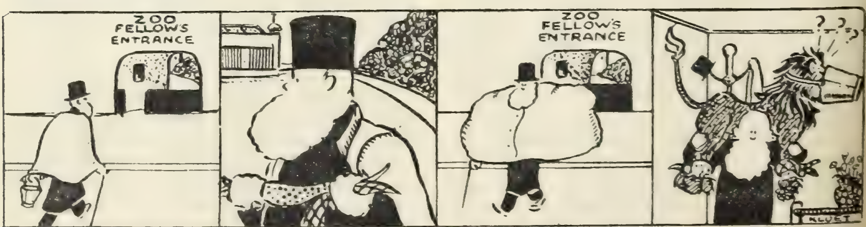
Reviewers should not, in my opinion, give praise where it is not due, and if criticism is made, then it should be constructive and not destructive.

A. E. H. seems, on the whole, to have done his job well. He has praised the very high quality of many of the photographs, the attractive colour plates and the useful details given in the second part of the book. He has, on the other hand, criticised the title, the retouching of some of the photographs, the lack of information on the scale of magnification of the photographs and the lack of an alphabetical index and cross references—but the remedies are suggested (or clearly implied) and could easily be included in a second edition.

In my opinion, however, the reviewer could with advantage have deleted his last two paragraphs. His remarks, without these paragraphs, are quite sufficient for a reasonable evaluation of the book to be made.

Perhaps, before I conclude, reference may be made to your remarks that ". . . . perhaps two-fifths (of the members) are removed from large centres of population where they could browse round well-stocked bookshops . . ." I do hope members will use to the full the facilities offered by County Libraries. Any non-fiction book is obtainable by post or personal call from the headquarters or a local branch and the usual loan period is one month.

Professor Fungus **By G. S. Kloet**



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The Amateur Entomologists' Society

ANNUAL EXHIBITION

1953

SATURDAY, 19th September, from 2 p.m. to 5.30 p.m. at **BUCKINGHAM GATE CENTRAL SCHOOLS,** Wilfred Street. London, S.W.1.

ADMISSION FREE.

EXHIBITS. The Hall will be open from 10 a.m. for receipt of Members' exhibits. Bring along your specimens (any Order, living or set), equipment, apparatus, photographs, drawings, etc. If you require a large space, notify Meetings Secretary in advance. Please label clearly.

TALKS. E. E. SYMS, Esq., F.R.E.S., on "OUR SOCIAL INSECTS"; W. J. B. CROTCH, Esq., M.A., on "REARING SILKMOTHS."

DEMONSTRATIONS. Members will demonstrate setting of coleoptera, diptera and lepidoptera, and the use of entomological equipment.

GROUPS. Members of Groups who have been corresponding will be able to meet for discussion.

OVERSEAS MEMBERS' EXHIBITS will be shown.

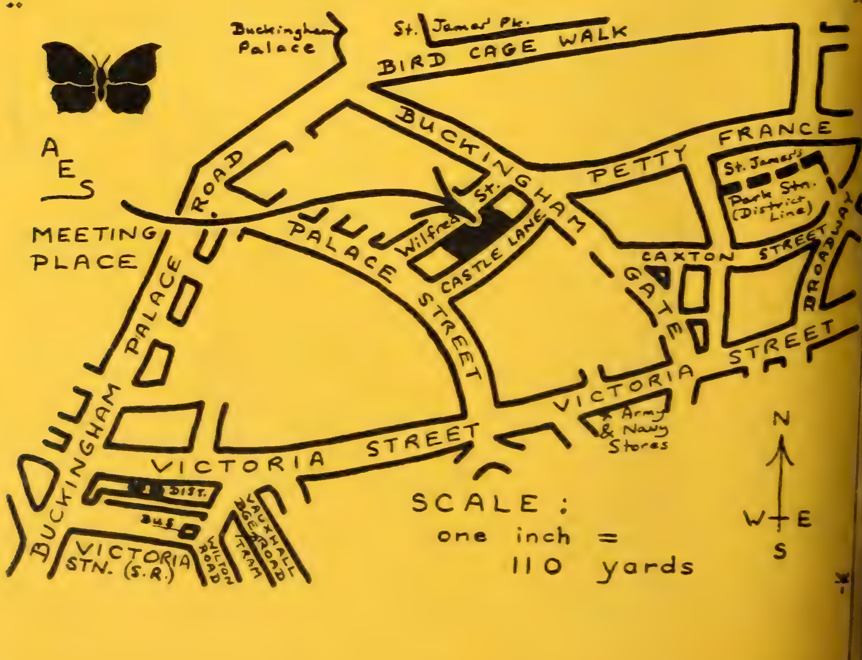
SURPLUS TABLE. If you have spare ova, larvae, imagines, equipment, books, etc., for sale or exchange, bring them along labelled with name, price, or exchange wants. No charge for use of this table.

ENTOMOLOGICAL TRADERS will be in attendance.

Offers of help and enquiries to Hon. Meetings Secretary (K. H. Bobe), 19 Hengist Road, London, S.E.12.

BRING YOUR FRIENDS AND AN EXHIBIT!

HOW TO GET THERE—



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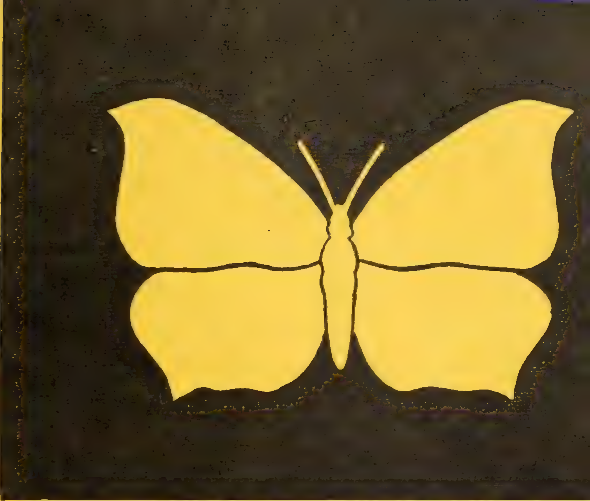

THE BULLETIN OF THE AMATEUR ENTOMOLOGISTS' SOCIETY

EDITED by W. J. B. CROTCH, M.A., A.K.C.

AES NOTICE

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Subscriptions (12/- per annum, 6/- for Juniors) to: P. C. LE MASURIER, *85 Warren Drive, Tolworth, Surrey.*

Youth matters to: S. M. HANSON, *167 Gunnersbury Park, London, W.5.*

AES BULLETIN

No. 154

OCTOBER 1953

EDITORIAL

Members will be a little shocked to find the *Bulletin* so thin this month. It has not been curtailed to save money (although that is an important point now that members do not seem to be able to recruit new ones very often): there was not enough good material in hand for the Editor to fill out eight pages.

If you want interesting issues, you really must not leave it to the other fellow to write all the notes and observations or reports on dodges! Please make a paper avalanche through the Editor's letter-box.

Members will also note, and this time with pleasure, the new cover picture for the winter months. We are again indebted to Mr. D. P. Golding for a beautiful scraper-board drawing from which the block has been made.

ANOTHER TALE OF A QUEST

As the nearest locality for the Large Heath, *Coenonympha tullia*, to the writer's home is some 180 miles away, it is in the nature of a major operation to have the pleasure of seeing it in its natural haunts. A few specimens were seen in early July 1940 in one of its more northern haunts in Westmorland, but as most of them were in a worn condition, a series was out of the question. In the course of a week's touring in 1947, a visit was paid to its most southerly locality in Shropshire; but none were seen, for the butterfly had not then emerged. Subsequent visits to this locality were made at the end of June both in 1950 and 1952 en route to Cumberland for *Erebia epiphron* (the Mountain Ringlet) (See *Bulletin* **11**, 98). On both occasions mainly worn specimens were seen and only one or two worthy of the collection were retained. It was, therefore, obvious that, if a series was to be obtained in good condition, a special trip would have to be planned somewhere about the third week in June.

While in the company of three other members of the Council, this idea was mentioned and the inauguration of what might well be termed a Field Meeting Section of the AES Council took place. It was decided that a week-end should be spent in north Shropshire, starting off at dawn on the 20th June, returning the following day. The members of the party were Messrs. K. Bobe, B. L. J. Byerley, S. M. Hanson and the writer. The last two are solely lepidopterists, the other two being mainly dipterists, although Mr. Bobe was also interested in obtaining the Large Heath.

The writer set off at 4.15 a.m., collecting Messrs. Bobe and Hanson in Ealing at 4.35 a.m. and Mr. Byerley in Harrow at 4.50 a.m. In this way the long trip up A.5 commenced, the weather looking anything but hopeful. A stop for breakfast was made in Wem (Salop) at about 8.30 a.m., but a Café previously known to the writer was found to be closed and the local hotel was not willing to provide breakfast. The journey was continued northwards and a most enjoyable breakfast was obtained in the little village of Coton. The sky was still considerably overcast, there were occasional bright periods, but no signs of the sun.

Fenns Moss was reached before 10 a.m. and the search commenced. Somewhat to the dismay of the lepidopterists of the party the one and only capture of *C. tullia* in the morning was made by the dipterist Byerley. After it had begun to rain, it was decided that the party should return to the car and have lunch, which was duly done. Almost immediately the weather showed considerable signs of improvement and the sun came out. Luncheon was packed up, the search again commenced, but somewhat further afield on this occasion. Soon a few specimens were disturbed from the heather and by the late afternoon a fair number had been captured. At no time were the weather conditions really favourable; as the sun did not remain out all specimens taken had to be disturbed from the undergrowth by constant tramping to and fro. Conditions were still more complicated by the presence of a strong southerly wind which carried the disturbed specimens away for some distance before they again settled. The surface of the Moss is intersected in many places by deep ditches where

the peat has been cut, and even in those places free from ditches the Moss is very boggy and treacherous. Consequently, it was not wise to run about without taking due heed of where one trod. Only the southern form ab. *philoxenus*, of course, can be found in this locality.

After a night's rest and sleep, a return was made to Fenns Moss again in exceedingly dull weather and the same small area where *C. tullia* had been seen the previous day was investigated. It is interesting to note that in spite of the fact that the sun was visible only for one brief period of a few minutes, no difficulty was experienced in disturbing a sufficient number of specimens. It would appear that, provided one passes within a few feet of a resting insect, it will be disturbed and fly, and thus enable captures to be made without a tedious search of the heather. As at least 60 specimens must have been flushed up each day in very poor conditions, it was assumed that the species must have been fairly plentiful; but only a few were retained. It was not, however, possible to obtain an accurate idea of the quantity of specimens in the area. The males outnumbered the females, but this was probably due to the fact that the females emerge later. The majority of the males were in reasonable condition although some were definitely worn; but all females seen were fairly fresh. It would, therefore, seem that the dates quoted for it in the majority of published books are incorrect, at least for this locality. In order to obtain fresh specimens a visit in the third week of June is essential. This conclusion is based on the experience of 1950 when the majority were definitely worn out by the last few days of June, and that of 1952 when the specimens seen were all tattered on the 28th June. As a further indication of the earlier date of emergence, in 1950 it was found to be in a very worn state at Bowness on Solway in early July; it was also found worn out in Merionethshire on the 28th June 1952.

Owing to poor weather conditions, only fourteen species of lepidoptera were recorded. It was with considerable surprise that a number of *Bupalus piniaria* (Bordered White) were discovered round the only two pines noted on the Moss. The two pines concerned were possibly some 20 feet high and very stunted in growth due to the poor soil. So far as was observed, there were no other pines within any reasonable distance. With few exceptions these *B. piniaria* were the northern form with a white background. One species not often recorded in Flintshire, *Polia hepatica* (Silvery Arches), was taken at rest on heather. The remainder of the species were all of common occurrence and not worth mention.

P. C. Le Masurier (978).

SCIENTIFIC METHODS: REJOINDERS

Colonel F. C. Fraser (890) writes: —

" In my advice to the young research student to eschew the materialistic approach to his studies, I was not suggesting that he should live in a fool's paradise, although any paradise is better than none at all. If a person loses his soul, he becomes a mere clod; and if he refuses to acknowledge life in the creatures he studies, he reduces them to the status of a mere clod, and/or a mere machine. Personally I have always found it very stimulating in my research work of over half a century, to regard the organisms which I happened to be studying as my distant relatives, be they animal or vegetable, beetle or buttercup, since the same life-line ran through us all and originated from the same spark of life. How inspiring it is to cast the mind back along the long line of evolution and how even more inspiring it is to try and look forward into the future and by our researches attempt to visualise the ultimate! In this surely is the antithesis of the materialist's outlook on life?

Mr. Bradley attempts to answer my query of what life is by quoting Prof. Young (*Bulletin*, p. 50), but I feel sure that the latter never meant his words to be a definition of life, since they are only a statement of the characters of life. Stripped of its verbosity, the definition tells us nothing of what life is. I would venture to give my own definition—"Life is a slender thread capable of reasoning and volition, and although its individual strands are continually being broken, yet, unlike anything else in our conception, it retains the power of reproducing itself *ad infinitum*".

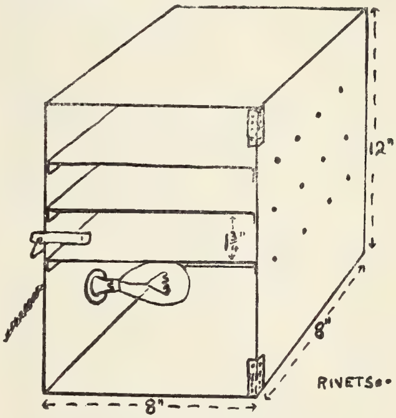
Mr. John Moore (146) writes: —

" While I am bound to agree with most of Mr. Bradley's able defence of the scientist's point of view, I must say that he rather spoils his case by

producing at the end of it a quotation which does everything possible to demonstrate that the scientist is a dry-as-dust, unimaginative and dreary fellow. He quotes Professor J. Z. Young, presumably a biologist, attempting to define "life". The "definition" is couched in the kind of jargon which we associate with the worst sort of bureaucrat, is largely untrue and where it is true is platitudinous. "Life is characterised by activities and processes and by the particular molecules that are engaged". This is hardly a definition unless the radioactivity of minerals and the processes of change undergone by inorganic chemicals are to be considered forms of life, which the biologist would surely deny. "Different types of life involve different processes, and each sort of life therefore produces certain types of molecules and certain visible structures". If this sentence indicates anything at all, it merely suggests to us that the cortex of a human brain and a slice out of the back-side of an elephant have a different appearance under the microscope as well as to the eye. "Specification of these chemical and visible units that we can abstract from the living organism is at present our only means of studying the system as a whole". This is the language of the Civil Service Form and the Marxist treatise on economics. It certainly does not touch our imagination. Professor Young may indeed be one of the best authorities, but so long as scientists insist on talking in these terms they will be vulnerable to the kind of criticism, mostly I admit misinformed, which Mr. Bradley's original article provoked. Surely science and the imagination must go hand in hand; and the scientist must never forget that words are the tools of his trade just as much as are his test tubes and his microtomes."

A DRYING OVEN FOR INSECTS

Collecting in Malta, where I am on military service, is so heavy that one needs dozens of setting boards, a factor which adds to the expense and the baggage of a collector. I have overcome this difficulty by constructing for myself a simple oven for drying insects quickly after setting. It is made completely of thin tinplate (except for two brass hinges), is riveted together and has a 40 watt tungsten-filament lamp as a heating element. The outside dimensions are 8″ × 8″ × 12″. The shelves have a clearance just under 2″. I hope that members will be able to follow the details of the construction from the accompanying drawing, which shews the door closed by a latch and hasp, but as if it were transparent—which, of course, it is not.



DRYING OVEN – DOOR DRAWN AS IF TRANSPARENT

It has always been my custom to cut my setting boards as purchased into halves. This makes each one 7″ long and an easy fit into my oven. Insects set one evening can be removed the next night without fear of drooping or springing in the cabinet. A little extra care has to be taken, because they are thoroughly dehydrated and tend to be brittle. An hour in a normal room will, however, rectify this, for the natural humidity of an island's atmosphere renders them less likely to fracture.

Moreover, I have found that delicately coloured insects with soft bodies, e.g., grasshoppers, tend to retain their natural hues, instead of turning brownish, as they would if dried slowly. One large beetle with body 2″ long and ⅝″ wide was perfectly hard after twenty-four hours in the oven.

D. H. HEPPELL (1690).

PLASTIC CONTAINERS

As a sort of delayed footnote to the comment on p. 20, the Editor thinks members may like to know that those who have no drill handy can make any necessary holes in plastic containers just as effectively by using a red-hot needle, nail or stiff wire. Plastic containers cannot be disinfected in an oven (see p. 60): they would melt.

A TEACHER RESPONDS

In response to the Editor's request for remarks concerning the application of entomology in teaching Natural History, the following notes may be useful.

I have just completed two years teaching Natural History in a Camp School in the Midlands. The obvious limitation of such work is the fact that pupils attend mostly for only four weeks, and in that period a vivid and arresting course of practical work is essential if anything of lasting value is to be achieved; there is, however, an equally obvious advantage in the Camp School, namely that the time available is not so strictly limited as in a normal school, and advantage may be taken of any spell of fine weather to the full.

Bird-watching was easily the most popular activity, and it was sometimes necessary to overcome a slight prejudice in order to divert interest to insects. One device that has been used successfully is to introduce bird pellets, through bird-watching, and this has led to some interesting work, mainly on moths and beetles.

The favourite opening gambit, however, on taking over a new group was to drop a casual remark at some spare moment that I thought I could catch a hundred insects in a morning using nothing but some jars and tubes. This was greeted with incredulity and it was then suggested that school time might be used to test out the idea.

A morning's collecting followed, starting in the School gardens and moving on to the river. The abundance of material having been demonstrated, the catch was released, and at the next session tubes were issued and everybody brought back half a dozen insects. Demonstrations of killing and carding followed (ethyl acetate was by far the best killing agent for school use, and Lepidoptera were omitted for the sake of simplicity) and an outfit was left out for spare-time work.

Identification was accomplished by a series of simple charts and keys on the walls, some of which were original, and some unashamedly adapted from well-known sources. This was rather cunning, because you could not identify your insect unless you knew quite a deal about its anatomy and characteristics. The first result of this method of learning was often an intense feeling of frustration, but a surprising number won through to quite a creditable knowledge of insects in a month. At this point, I should like to make a plea for a suitable identification book or books for use in the Secondary Modern Schools. I have a library consisting of works of all types but these are either inadequate "popular" works, or monographs whose format and technical vocabulary are not calculated to inspire this type of student.

After a week, interests digressed. Some boys and girls were content to amass a general collection for proud exhibition at home, while others preferred restricted groups. A few showed a desire to experiment, and we did some interesting trapping and counts from time to time.

The opportunities for following through life-histories were, of course, restricted, but one of our most successful efforts in this direction was the rearing of Puss Moths with a group of sub-normal boys who were with us for a long period. They were able to watch the female lay eggs, and once these had hatched, the progress of the caterpillars was followed daily with rapt attention.

I now hope to commence some rather different experiments in teaching Natural History with a different type of pupil in a village school.

I hope to communicate, when time permits, some notes on specific problems which we have encountered.

P. J. Prosser (2041).

Professor Fungus — **By G. S. Kloet**

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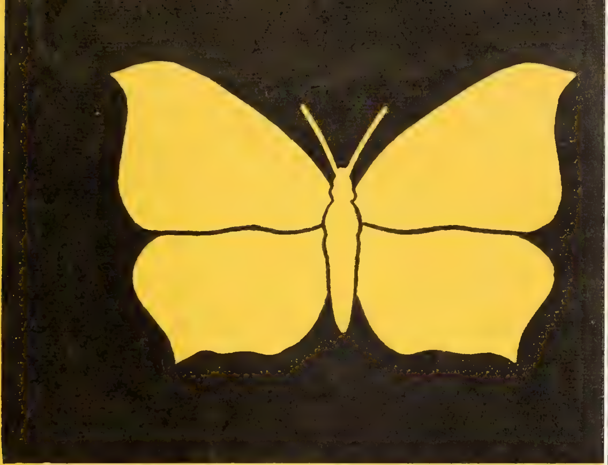

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JUNIOR MEMBERS' NUMBER

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AES BULLETIN

No. 155

NOVEMBER 1953

EDITORIAL

We congratulate the Junior Members on the excellence of their response to the Youth Secretary's challenge. This number is made up of their contributions and two have had to be left over. Even the book reviews are by juniors.

●

EXPERIMENTS WITH THE MUSLIN MOTH

In 1952 I reared a number of Muslin Moth (*Cycnia mendica*) caterpillars which duly produced seven pupae. These pupae all hatched out at the end of February 1953, as they were kept in a warm room; five were males and two—one of which was deformed—were females. The perfect female mated with one of the males and laid a number of eggs on the night of the 26th February. These eggs hatched on the 16th-17th March, the young caterpillars being fed on dock.

At the beginning of April I decided to carry out some experiments with these caterpillars. To that end I picked out forty approximately equal-sized caterpillars and divided them up into four groups, A, B, C and D, of ten caterpillars each; the remaining nineteen, most of which were much smaller, were called group E. Subsequently group E was divided up into four further divisions, E_1, E_2, E_3 and E_4, the first three of four caterpillars each and the last one of seven. The experiments I wished to carry out were these:—

(i) With group A, to try the effect of the addition of sugar to the caterpillars' diet.

(ii) With group C, to try the effect of not standing the foodplant in water. This group was therefore provided with dock leaves not standing in water, while group B, the control group, had leaves standing in water.

(iii) With group D, to try the effect of perpetual darkness on the caterpillars. They were therefore fed in the same manner as group B, but kept in darkness, except for about five minutes each day when I was changing their food.

(iv) With the various sub-divisions of group E, to find what other plants the caterpillars would eat.

These experiments were started on April 4th and from time to time the caterpillars of the first four groups were measured with a ruler, so that rough comparison as to size could be made between the various groups. I should have preferred to weigh them, but could not get an accurate balance. Further, to make the experiments as accurate as possible, the caterpillars were kept in identical containers (1 lb. jam jars with paper caps) in light of approximately the same intensity (except group D) and fed on dock leaves as far as possible of the same age and texture and from the same plant.

The group results are given below:

Group A. From the 4th-9th April these caterpillars were fed on dock leaves standing in a 4% sucrose solution (sucrose being the only sugar available). This proved unsatisfactory as the leaves tended to wilt, although the caterpillars did not seem to mind and ate almost as much as those of the other groups. On the 10th, having obtained some glucose, I painted some leaves (stood in water) with a thick syrupy solution of it on the upper surface only; this dried to a thick crust like icing on a cake. The caterpillars did not like this and went to the undersurface, where they nibbled holes in the leaf without eating any glucose. To counter this, the leaves were painted next day with a thin paste on both sides; the caterpillars promptly severed the leaf stalk (not painted) close to its join with the leaf. Similar treatment on the next two days had the same result, and on all three days very little leaf was eaten. On the 14th, the leaves were painted with a weak glucose solution. This was more successful as the caterpillars ate more, but there was little glucose on the leaves. Also as this treatment was continued the atmosphere in the jar became damper and damper, and the caterpillars more and more unhappy, so, finally, I gave up the experiment on the 24th April. The caterpillars had lagged well behind the control group all the time, and it took until June 10th for the last one to pupate, as against May 17th for the last of the control group. Of the original ten caterpillars of the

group, one was lost; one was accidentally killed; two died (24th May, 4th June); one failed to pupate; one produced a deformed pupa and four produced satisfactory pupae, which seem to be very slightly larger than those of the control group.

Group C. This group was being fed on leaves not stood in water. As compared with the control group B, which had leaves standing in water, this group moulted in more of a bunch and, though at first lagging behind as regards size, they soon made it up. They pupated at the same time as the caterpillars in group B, their pupae seeming slightly larger than those of that group. From all this it would seem that *mendica* caterpillars do not mind whether their food is in water or not.

Group D. This was a most interesting group. At first they did well—as well as the control group B, in fact. About April 20th the decline started. On April 22nd I wrote in the day-by-day record I was keeping:—"Most larvae in this group are on the bottom of the jar and looking very unhealthy . . . . All except the four biggest larvae are peculiar in that they are small and very dark with certain very short whitish hairs on the side." The normal caterpillar at this stage (4th instar) was greyish, with greyish brown hairs, and upwards of 20 mm. long; these dark ones were not more than 17 mm. After this the caterpillars died off rapidly and only one made a coccoon (20th May) but failed to pupate in it. On two occasions in this group one caterpillar was seen nibbling another; this was not seen in any other group.

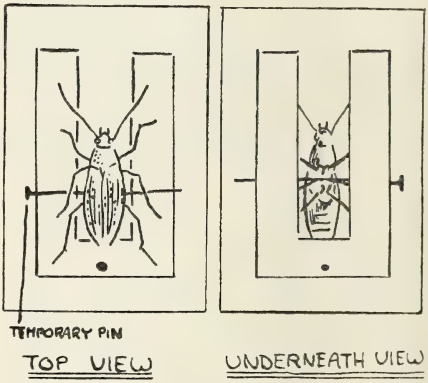
Group E. I was under the impression before this experiment was begun that, once a caterpillar had been started on a particular foodplant, it was difficult if not impossible to change it to another. How wrong I was! Each sub-division of the group had about ten changes of foodplant and they all throve. Briefly, the following foodplants were very popular: Red Deadnettle, Rowan, Clover, Wild Arum, Stinging Nettle, Hollyhock, Plantain, Shepherd's Purse, Privet, Willowherb, Blackberry, Cowparsnip, Male Fern, Elder, Ivy (young leaves), Hazel, Hawthorn, White Deadnettle, Hedge Mustard, Blackcurrant, Raspberry, Stitchwort, and Hedge Parsley. The following were fairly popular: Dandelion, Mint, Cox's Apple, Honeysuckle, Lilac, Quince, and Birch. The following were disliked: Lime, Maple, Geranium, Anemone, Primrose, White Violet, Daffodil, Woody Nightshade, Buddleia, Tulip, Wallflower, and Horse Chestnut.

J. P. S. Pringle (2094*).

AN IDEA AND A PROBLEM

I have worked with success what I believe to be a new method of setting beetles, bugs, cockroaches, etc., which enables a direct underside view. It is best described by the diagram. White card is easier to obtain than any strong transparent material, and this method also enables a direct view of the underside.

Until the insect is stiff a pin can be placed on the card underneath the insect to hold the abdomen up. The pin must not touch the gum, otherwise it will be difficult to remove when the insect is stiff. If the legs are not strong enough to hold up the body, a strip of cellophane paper can be fixed to the underside of the card.



I would like to know a method of holding pins in position in the box when a bump occurs, other than merely pressing the pins down harder or avoiding bumps.

I have tried unsuccessfully:

(a) Horizontal and vertical strips of cotton to hold the pins in place. These apart from being a nuisance and difficult to arrange, are impracticable as the pins cannot be horizontally level, nor in some cases vertically.

(b) A sheet of cellophane paper across the box underneath the labels, which have to be fairly high on the pins. This did not work as the paper tore so very easily, and any paper came away from the side or dislodged all the pins when another insect was placed in the box.

I would be grateful to hear the experiences of other members on this matter, as insects get so easily damaged in this way.

C. M. Idle (2118*).

BRITISH SOCIAL WASPS

This is really a humble sequel to Mr. Poole's articles on collecting Bumble Bees (*Bulletin* **11**, *seriatim*).

The Social Wasps contain seven species which make up a group of striking insects with their black and yellow bodies. Although the colours of all the species, except *Vespa crabro* (Hornet), are yellow and black, the patterns on the abdomen are different and this gives a ready guide to their identification.

Castes

There are three castes in all the social wasps, excluding *Vespula austriaca*, in which the worker caste is missing:—The queens which are normal females; the workers which are females only capable of laying infertile eggs which develop into males; and male wasps.

The queens are the largest, while the males come next in size and the workers are the smallest. Queens and workers have twelve joints in their antennae. Males of all six species (excluding *V. crabro*) have their first joint, nearest the head, more or less all yellow; but in the females of the following species (*V. vulgaris, germanica* and *rufa*) the first joint is quite black, while the others (*V. sylvestris, norvegica* and *austriaca*) have it of a bright yellow underneath.

The queen's job is to start building the nest and then to lay eggs. The workers take over the rest of the building from the queen and tend to the grubs. The males only pair with the fertile females, who will be next year's queens, and they do not appear to do any other jobs for the rest. All male wasps are stingless.

Life Histories

When the first warm days of spring arrive, the queen, one of last autumn's brood, emerges from her winter hibernation in the hole or cranny which she chose last year. She then begins to search the neighbourhood for a suitable spot in which to build a nest. The nest may be built in a hollow tree, a hole in the bank, an outhouse, or under the roof of a house. When the queen has found a suitable nesting site, she builds a stalk from which the nest is to hang when it is finished; she attaches a small group of cells to it, and then more cells are placed around them and so on. Each cell contains an egg. When the young grubs hatch they are attended to by the queen until they are fully fed, then they seal their cells and pupate. When they emerge from the pupa, they eat their way through the top of the cell and emerge from the cell as a fully grown wasp.

These young wasps appear about the beginning of July, they make up the first batch of workers. They then share the work, building more cells and tending to the grubs. Soon after this the queen stops work and concentrates upon egg laying. During the spring and early summer only workers are produced in the nest, but in the late summer and early autumn males and females appear. The young females, which will be next year's queens, pair with the males and then search for a place in which to hibernate until the spring calls them forth again. The males and workers and the old queen die as soon as the temperature drops in the late autumn.

In the case of *V. austriaca*, which is a parasite on *V. rufa*, no nest is built and only queens and males are known. No workers of this species have been found.

Food

Wasps are omnivorous feeders, that is they are not restricted to a plant or animal diet. Sugary substances, such as jam, treacle and fruit are a prominent part of their food. Also meat, when obtainable, together with other insects. A saliva exuded by the grubs in the cells is much relished by the workers.

Collecting

Wasps are best caught in a net of some kind and then either transferred to glass tubes or pill-boxes or put straight into the killing bottle. Either Ethyl Acetate or Potassium Cyanide is a good killing agent, as it kills them almost immediately and leaves the specimens nicely relaxed for setting. Setting is done on an ordinary flat board about two inches wide with about ¼″ groove in it; a slightly larger board will be needed for *V. crabro*, but all the other species are about the same size.

The Nest

A wasp's nest is composed of what is commonly called 'wasp paper'. Wasp's paper is usually made of wood, sand, paper or any other material that is suitable and available; which the wasp has chewed up and bound together by a mucous secretion. Wasp

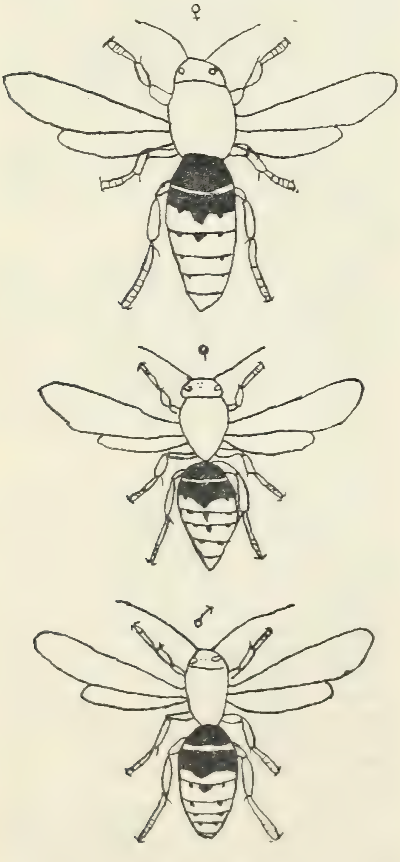
paper varies in colour from grey to a light sandy brown, according to what materials have been used. *V. germanica* uses sound wood, while *V. vulgaris* prefers wood which is rotten and has been subjected to the weather.

The nest is built up cell by cell in tiers, about eight or nine being the usual number of tiers in a nest. The tiers are then enveloped in a dome-shaped covering with an entrance hole at the bottom, so that the whole lot resembles a rough sphere hanging by a piece of cord.

THE SPECIES

Vespa crabro (Hornet)

This is the largest British species. It usually nests in trees or buildings. It can be recognised by its large size and its brown and orange colouring instead of the usual bright yellow and black.



V. crabro

Vespula vulgaris (Common Wasp)

Usually builds its nest in a hole in the ground, and makes it from rotten wood. It can be distinguished from *V. germanica* by the fact that the two yellow stripes on the thorax running from the "neck" to the insertion of the wings are parallel sided. It has four yellow spots on the thorax behind the wings. There is an anchor-shaped mark on the face.

V. germanica (German Wasp)

Resembles *V. vulgaris* in appearance and habits and is equally abundant. It may be distinguished by having the two side lines on the thorax triangular, not parallel sided. It has four yellow spots behind the wings. The face is marked with either three dots or a line and two dots, it varies in different specimens.

V. norvegica (Norwegian Wasp)

Usually builds its nest in bushes, quite often in gooseberry bushes. It is a darkish insect, but sometimes marked with a reddish tinge similar to *V. rufa*. It may be distinguished from *V. sylvestris* by having a broad and thick black line on the face instead of a single dot.

V. sylvestris (Tree Wasp)

Usually makes its nest in a hollow tree, but quite often in a hole in a bank. It has a small black dot in the centre of its face. Its markings are more constant than in any other species.

V. rufa (Red Wasp)

It is an underground builder, but rarely seen in houses as *V. vulgaris* and *V. germanica* are. It may be recognised by having the abdomen and legs more or less a reddish colour. The black markings are not so easily defined and it is very variable in colouration. The abdomen is fairly shiny and there are only two yellow spots on the thorax.

V. austriaca (Wood Wasp)

This is a somewhat rare wasp and has very distinct habits from all of the other six species. It is a 'cuckoo' or parasitic wasp laying its eggs in the nest of *V. rufa*, which it somewhat resembles in colour. It has three black dots on the face instead of a black anchor as on the face of its host. Only queen and males have been found, the worker caste is missing.

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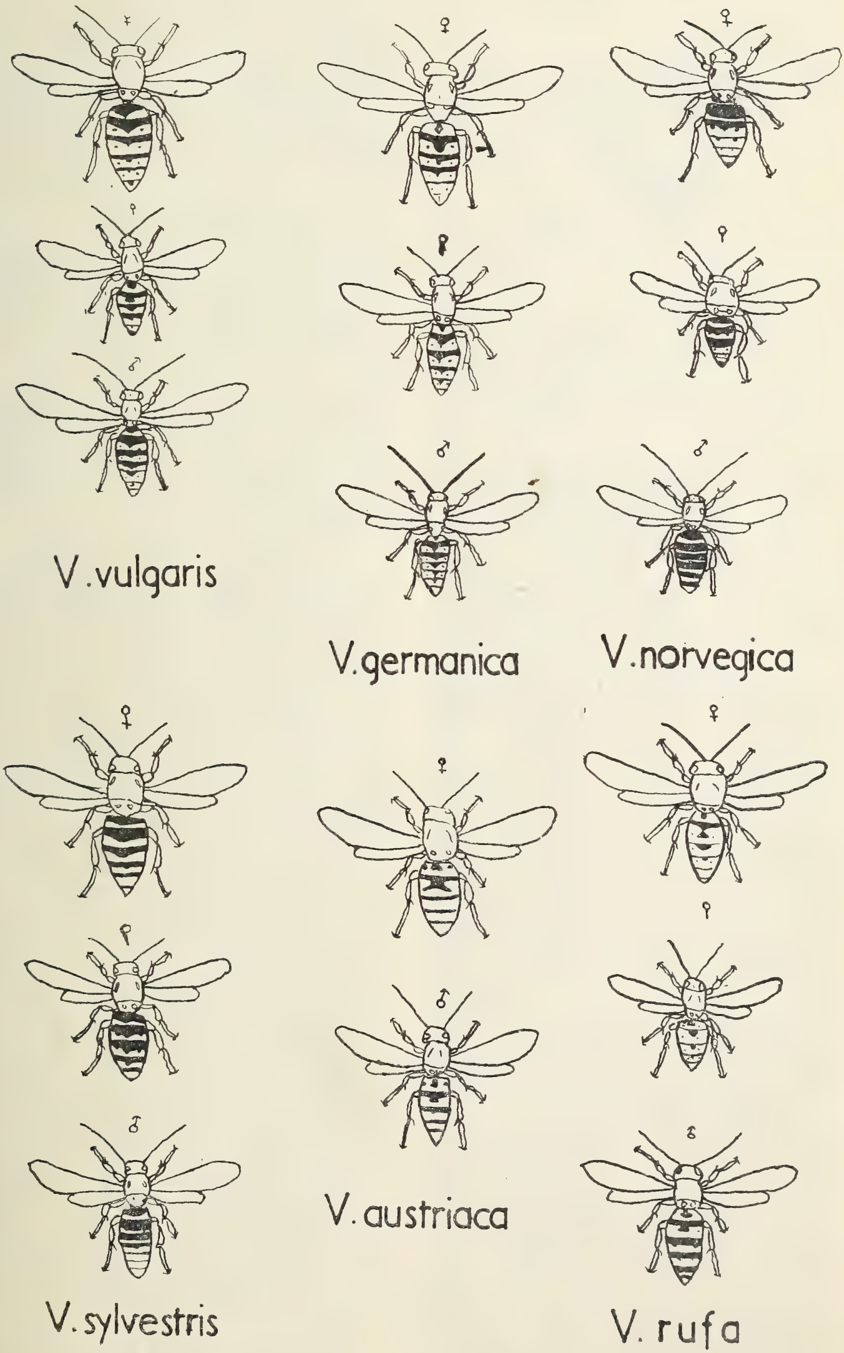
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V. germanica
V. norvegica
V. sylvestris
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V. rufa

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D. I. CHAPMAN (1648*).

A STRANGE PAIRING

As I live close to Mr. Smith of the Silkmoth Study Group, I spend quite a lot of time helping him with his tropical caterpillars.

On Sunday, 28th June 1953, I watched a female *Actias selene* (Indian Moon Moth) emerge. It was one of two that had overwintered naturally and I hoped to see the other one come out, prove to be a male, and pair.

As this did not happen, the moth was put in a large pairing cage for storage. Later, the same day, a male *Antherea pernyi* (Chinese Oak Silkmoth) emerged and was also put in the same cage. This made me ask what sort of moth would emerge if the two paired. Mr Smith explained with great care that this was not likely to happen, because they were not very closely related species.

When I arrived the next evening and asked my usual question, "Anything fresh?" I was told "No." On looking in the cage, however, I saw *pernyi* and *selene* so close together that I was sure that they were paired. This surprised Mr. Smith very much, but on looking closer he found that this was so. I do not know what time the pairing took place, but as both species normally pair about midnight, I presume that is when it took place. They broke just after 10.15 p.m. and by the following morning 70 ova had been laid. Only a further 5 ova were laid altogether after that. Mr Smith was convinced that the ova would not be fertile and on this occasion he proved correct, for, although the ova were looked after very carefully, no larvae formed inside them.

As the males usually find their female partners by tracking down the scent given off by the scent glands, it seems likely that the scents of these two moths must be very similar.

I have since learnt that Mr Harrison-Gray (1806) had a similar experience at about the same time, but in his case the female *selene* had already been paired with one of her own kind an hour or so before her pairing with *pernyi*. The ova were fertile and have hatched, but whether any show cross strains I have not yet heard. We shall probably have to wait for the moths to be sure.

Perhaps it is wishful thinking on my part that fertile ova will result from a similar cross pairing and that we shall see *selene* with the eye-spots of *pernyi* and vice versa—or would it be some other mixture of the two? Who knows?

A. R. WOODMAN (2175*).

OBSERVATIONS

On the afternoon of 7th July 1953, while at work (City Treasurer's Department, Manchester Town Hall) one of my friends brought me a dead specimen of a male *Aeshna grandis* which he had found in the corner of the room in which he was working. The left forewing was damaged, and the head was completely missing, but the body, and remaining three wings were still intact. Whether it had come to pay its water rate, or attend a meeting of the council, it never lived to tell.

G. A. HARDMAN (2050*).

I was collecting with a past member of the AES in a Hertfordshire wood, called Symond's Hyde, last Sunday (Aug. 9). It was a hot day and there were plenty of butterflies on the wing. At about 3 o'clock we were pushing our way through a thick undergrowth of Willowherb when he let his eyes follow a tattered old female Silver Washed Fritillary. He called my attention, having mentioned earlier that it was the right time of year to see *paphia* laying. Sure enough and much to our interests in her wavering path she alighted at the base of one of the narrow trunks of a rather shrubby Ash tree. Her abdomen curled round and one could see that she had left something behind. In short hops she flew up it, depositing an egg at each landing. After a rest, feeding at a flower, she flew on to another tree to repeat the same actions. There was violet, the caterpillar's food-plant growing on the ground round each tree, though it is puzzling to wonder what degree of chance rules the choice of so conveniently situated a position.

We looked for the eggs and found them, small yellow things grooved with lines from tip to bottom. Each was placed within a crack in the dried-up bark, on the upper side, and cleverly hidden from sight.

I. I. T. EVANS (1576*).

During the year I have seen three male dwarf Orange-tip Butterflies, *Anthocharis cardamines*, one of which

I captured for my collection. Mr. E. B. Ford says ("Butterflies", New Naturalist Series, pp. 220-21) that this form is to be seen prior to the normal emergence. This was not so in my locality (Potters Bar, Middlesex), because they were all seen well after the first normal males were flying. Their emergence did, however, coincide with that of the normal females. Mr. E. Sanders gives the name of this dwarf form as ab. *hesperidis* ("A Butterfly Book for the Pocket", p. 265). No indication is given that it is exceptionally uncommon. Those I saw were a very small percentage of the total number flying in the same locality.

B. J. ODELL (2054*).

In an article in another magazine, Mr. Antram, F.R.E.S., told of observations of *Thecla betulae* on the wing. These contradict the previous belief that this insect is seldom so seen.

My own experience this year may also help to disprove this idea. While passing a field near Exeter on 7th September I noticed something on a hedge which caught my attention. A rather worn female was sunning itself on hazel and flitting along the low hedge. Not having a net I failed to catch it. In an hour's further search of the area I saw several butterflies at the tops of trees, but could not definitely identify them.

On 11th September I visited a known locality in the New Forest. I had an afternoon's searching around blackthorn bushes before I noticed a female on heather blossom. This was not taken.

I think these notes show that this insect can be seen on the wing quite easily if it is searched for in the right places up to September.

C. S. SCOTT (1763*).

Members of the Felsted School saw on 19th July in the grounds of Spain's Hall, Finchingfield, Essex, an interesting variety of the Comma butterfly. Mr. J. H. Lee reports that he, another master and a boy viewed it from one to two yards. Unfortunately, they had no net and although they attempted to catch it with a jam jar, it flew off and was not seen again. The Secretary of the School N.H.S. made a special journey there the following day to look for it, but did not find it.

The accompanying diagram is an average of the impressions gained by the three observers of this male *Polygonia c-album*. It was reminiscent of Frohawk's Comma plate, fig. 14.

♂

LEPIDOPTERA IN HOLLAND

At the end of August last year I was on holiday in Central Holland, but had the chance of collecting only in one restricted, sandy area, where the vegetation was mainly heather, coarse grass and young conifers. As the evenings were very cold, comparatively few moths were flying. I had a Tilley paraffin lamp with me.

I was interested to find *Luceria virens*, recently discovered in S. Ireland, not uncommon. Specimens on the wing were mostly very worn; their beautiful green forewings having faded to a pale buff. However, I found four on different evenings, clinging to grass stems with their wings not yet inflated. Each was found at about 9.30 p.m.

The Central European Noctuid *Ammoconia caecimacula* (W.V.) was common, and very fresh. Specimens of *Ellopia fasciaria* (Barred Red) were very pale, and one green var. *prasinaria* turned up. *Agrotis vestigialis* (Archer's Dart) was abundant; most being very dark, and a few having the forewings heavily suffused with black. *Agrotis ipsilon* (Dark Sword Grass) was also abundant, and *Celaena haworthii* (Haworth's Minor) was not uncommon.

Amongst many species of common moths were the following:—*Tholera popularis* (Feathered Gothic), *Tholera cespitis* (Hedge Rustic), *Abrostola triplasia* (Dark Spectacle), *Hepialus sylvina* (Orange Swift), *Deilephila elpenor* (Elephant Hawk), *Hydroecia oculea* (The Ear), *Luperina testacea* (Flounced Rustic), *Thera obeliscata* (The Pine Carpet), and *Thera firmata* (Grey Pine Carpet).

Few butterflies were found; the only species of interest being *Argynnis lathonia* (Queen of Spain fritillary). *Hesperia comma* (Silver Spotted skipper), in this country virtually confined to chalky soils, was common.

DAVID S. SMITH (1755*).

REVIEWS

The Observer's Book of Common British Insects and Spiders. By E. F. Linssen and L. Hugh Newman. Pp. 114 and index, with 64 plates (32 in colour). Warne, London, 1953. Price 5/-.

Each of the twenty-one orders of insects and some of the spider class have been briefly but competently outlined in this inexpensive, comprehensive, and clearly printed book, which is a convenient pocket size.

The majority of the book, written by E. F. Linssen, F.Z.S., F.R.E.S., is interesting, informative, and of a high standard throughout. Popular names of insects are used where known, and are preceded by the corresponding scientific terms.

Unfortunately, the sections on Trichoptera and Lepidoptera, written by L. Hugh Newman, F.R.E.S., F.R.H.S., do not compare well with the rest of the book. No scientfiic names are used in this section, and the author gives a detailed account of the habits and life histories of some insects, while completely omitting those of others, equally common. Many of the facts are not clearly expressed, and the reader may easily become muddled.

The coloured illustrations are not nearly as good as the black and white photographs. The colour plates of butterflies are misleading and those showing their wings closed, or partly closed, certainly do not do justice to their beauty. As none of the illustrations is placed in the required position in the text, the reader has constantly to turn the pages in order to find the plate to which reference has been made. For example, page 31 still refers to plate 1 opposite to page 18, whilst page 32 goes straight on to refer to plate 5, which is opposite to page 26. The effect is very tiring to a reader, but, of course, the book is for an observer, who may wish to look up only one or two insects at a time.

I would not recommend this book to anyone wishing to specialise in any order, particularly Lepidoptera; but those wishing to acquire an observer's acquaintance with all orders will find it useful and worth the moderate price.

Eve Woodstra (1948*).

The 30th and 31st Reports of Gresham's School Natural History Society, 1952 and 1953. Pp. 46; 4 plates. Price 2/-.

These reports of Gresham's School N.H.S. are well edited and printed. They include lists of the flora and fauna around Holt in Norfolk, where the school is situated. The compilers of the lists appear to have been thorough in their observations and records. The reports also include notes on expeditions to places of interest to the naturalist; a meteorological section; and accounts.

The volume will be useful to members of the AES who live in the district or visit it. I always find it helpful when going to a district which is new to me to look at a list of the flora and fauna of that district. It avoids the annoyance of missing interesting plants or insects occurring in the locality.

It is pleasing to see records of the orders Coleoptera and Hymenoptera, in which they include lists of Ichneumonidae. So often School Natural History Clubs limit their recordings to Lepidoptera.

The society must be fortunate in having members interested in the less well-known botanical and zoological groups such as mosses, lichens, mycetozoa, mollusca and the crustacea.

D. I. Chapman (1648*).

JUNIORS WANTED!

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EDITED by W. J. B. CROTCH, M.A., A.K.C.

AES BULLETIN

No. 156

DECEMBER 1953

DEFENCE BY STARTLING

Many reams have been written both for and against the Theory of Mimicry; much also about Protective and Warning Colours. But the method of insect defence which, for the purposes of this article, I call "Defence by Startling," although it ties up with all these three, seems to me to be worthy of more mention than (so far as I am aware) it has received. I am not suggesting that there is anything new in the idea: I merely propose to give some interesting instances that have come to my notice. Perhaps we in Africa, where there are so many noxious creatures, are more keyed-up when collecting than you are in England. At all events I have received many shocks when so engaged—shocks that, from the insects' points of view, have been highly successful.

Various methods of startling are employed. First, there are the insects who, believing that offence is the best defence, inflict a sudden pain. The common Wasp is a sufficiently familiar example. In Kenya we have far too many insects that adopt this method. I may mention the large Lasiocampid larvae who suddenly expose brilliantly coloured cushions on the thorax, and then, by a lightning-like lunge, plant a bunch of hairs in the hand of the unwary—hairs that inflict pain quite as severe as a wasp-sting, and far more lasting.

Then there are those who rely on making their escape while they have momentarily disconcerted the enemy. An example of this is the big Noctuid moth *Othreis materna*, which usually sits low down among the long stems of meadow-grass. Here the pattern of the forewings—a mixture of browns, greys, and greens—makes it almost invisible; and two of the veins being strongly marked in white give the effect of just two more among the thousands of interlacing stems. So far, merely protective colouring, of course. But when it is disturbed, not only is there a sudden and most alarming display of brilliant orange, black and white (the very ample hindwings), but the creature flies off with a loud scratchy, rattling noise which makes one wonder, just for the critical moment, what sort of animal one has disturbed. The forewings are very hard, of rather parchment-like texture, and the rattling is possibly caused by their scraping against the grass-stems. However it may be caused, the noise, together with the sudden flash of colour, is enough to send even an entomologist's heart well up into his mouth. When he has recovered from the shock, *materna* is far away.

In another method, the insects try to startle their enemy into making *his* escape, leaving them in peace. Members of the Silkmoth Group are no doubt acquainted with the large Saturniid moth *Gynanisa maia*: but unless they have seen it in its natural surroundings—on the bark of a Wattle tree, for instance—they may perhaps not realise how when one extends a tentative finger towards what may—or may not—be just a bit of bark, the finger is promptly withdrawn as the dark forewings are very slowly raised, exposing a rather melancholy pair of "eyes," and then slowly closed again. There is something menacing about the very slowness and deliberateness of the movement: it is as if a big bully was staring at you contemptuously and saying "Well, do *you* want to start anything?"

Perhaps the strangest form of Defence by Startling is the "imitation" by these invertebrates of vertebrate forms. The Catocalid moth *Cyligramma latona* has well-developed eyes on the forewing: not just spots, but realistic eyes, complete with apparent pupil, iris, eyelid and eyebrow. When the moth sits, as it usually does, head downwards in some slight depression in the side of a bank, with its wings folded into a not quite flat triangle, and its antennae not tucked away out of sight, but held

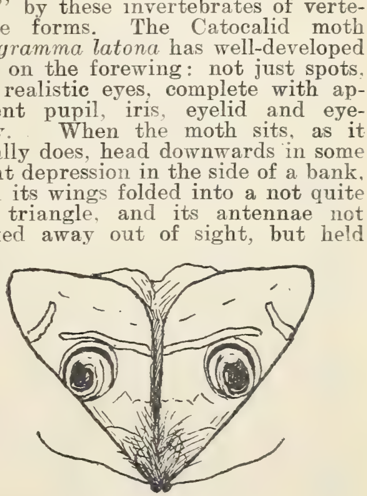


Fig. 1.

out sideways like a cat's moustache, one could almost swear that some small weasel or cat-like mammal was staring at one out of a hole in the bank. Fig. 1 gives no idea whatever of the "reality" of this likeness. That would require not only colours, but a much better artist. The eye is dark bluish-grey, with a metallic glitter that shifts as you change your angle of vision. There is a minute white speck, like the reflection that you will see in the eye of any portrait, and there are many other realistic details. In the figure I have not attempted to give an idea of the quality of the imitation: merely to show how it is produced. There are larger Noctuids (Genus *Nyctipao*, with wing-span of $4\frac{1}{2}''$ and more) which adopt the same or similar markings, and the same position. I can assure my readers that when one is poking about in the rather dark, shady places that these moths frequent, the sudden vision of a motionless mammalian head, with baleful eyes and bristling whiskers, is enough to give anyone a shock!

To turn to larvae. The "Threatening attitude" of the Puss moth comes, presumably, in this category, though it is a very mild example, and it is difficult to say what creature the larva is supposed to represent. Two Kenya species are worthy of mention. First, a Notodontid, *Stenosaurus impeditus*. As with many Notodonts, the anal segment is a large bulbous affair, held well up off the twig on which the larva stands. In *impeditus*, there is a brilliant crimson streak running round the bulb, halfway up, turning slightly up at the ends, thus giving the idea of a grinning mouth. A red and white spot above each end represents an angry, bloodshot eye. Seen from behind, the larva might well be some nightmare creature with an angry, menacing, and clearly vertebrate face. But this is not all. When alarmed, it wags this horrid face at you, sideways: and at the same time *takes three or four rapid steps backwards* (that is, towards you). Startling? Yes, definitely, on the first encounter. After that, a most ludicrous performance.

The other larva is that of the large Hawkmoth, *Hippotion osiris*. It puts up two different quasi-vertebrate shows. The first is the same as that attempted by the Elephant Hawk larva in England. (See South, "Moths of the British Isles", Vol. 1, Plate 17.) But the larva of *osiris* is very much bigger than that of *elpenor*, and its performance is much more thrilling. When the thorax is extended, as when the larva is feeding, it has the look of some small but very fierce Saurian. The small head represents the snout, the legs are formidable fangs, and the "eye-spot" on the first abdominal segment, though admittedly rather large for so small a croc, is decidedly threatening. In late life, *osiris* often skulks in the mass of débris under its favourite foodplant, a low growing, wide-spreading vine (*Cissus*). My wife, who has been well accustomed to larvae of many sorts for many years, also to snakes, having lifted up a branch of this plant one day, dropped it again rather hurriedly, calling out "There's a snake here!" I hurried up with my stick ready. The snake was an *osiris* larva. Skin black and shiny, thoracic segments fully retracted, two large lidless eyes staring from the wide head formed by the swollen segments: since it was partly covered by leaves one could not tell how long its body might be: it certainly did look like a viper of some sort. Fortunately, I had met it before, so that, although I was deceived for a moment, it did not meet the usual fate of snakes.

There have been previous mentions of Spiders in our *Bulletin*; so that although this is supposed to be about the defences of Insects, I venture to tell of a spider that I caught two weeks ago. Seen from behind, its bloated abdomen, measuring over 20 mm. across, and about the same from waist to spinneret, looks almost exactly like the head and face of an ordinary, but rather comical, cat.

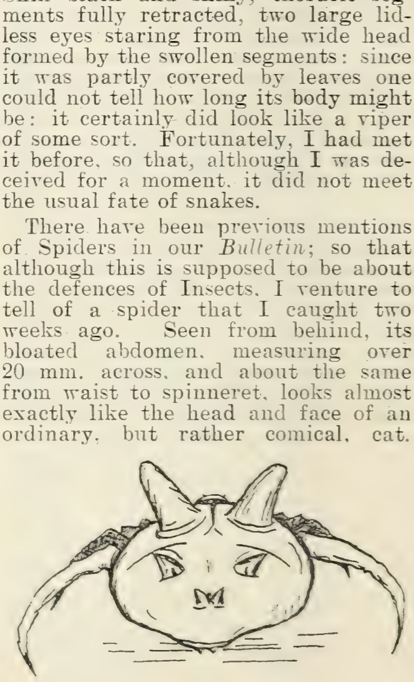


Fig 2.

Fig. 2 gives only a poor idea of the thing. There are two diverging humps on top of the abdomen (the cat's pricked-up ears). Two much smaller ones, very close together, nearer the tip of the abdomen, for the nostrils. The two hind-legs, curving round on either side of the body, suggest the cat's paws. The resemblance is quite ridiculous. One thing I think is really remarkable: that is, that as one moves one's head so as to see

the thing from one side or the other, the eyes seem to follow, just as do the eyes of a portrait in which the sitter is looking directly at the observer. This effect seems to be caused by some sort of reflection of light from a pale streak under the eye-tubercle. The spider is in front of me as I write. It has been dead for a fortnight, but those eyes still follow me round. . . .

Those who have not seen these creatures for themselves will, no doubt, tell me that the resemblances are largely fanciful: that it is all wishful thinking: that I am far too imaginative for an entomologist. And what about their size? What use is a 5″ crocodile, a 2″ dragon, or a cat with a 20 mm. head? To the last objection I reply that the study of generally accepted "mimics" (e.g., among the African Butterflies) seems to show that the proportional size of model and mimic goes for very little. To the other criticisms I can only say that many of my friends, both entomologists and non-entomologists, have seen the creatures; and their reactions, unprompted by me, have been most satisfactory!

It is perhaps not too difficult to believe in the imitation of (or resemblance to) a noxious or unpalatable insect on the part of a harmless or pleasant-tasting one. But why and how have these caricatures of *vertebrate* forms been developed in the invertebrates? Why, for instance, does *latona* nearly always sit head-downwards? How has *impeditus* "learnt" that, to give the right impression, he must make those few purposeful steps backwards? Again, at what sort of enemies are these defences aimed? What can a Pompilid wasp know about a crocodile? An Ichneumon-fly about a snake? Is a bird going to say "Heavens! That's a cat! A small one, certainly, but I object to cats. Hop off!" Or is one to suppose that Nature, over hundreds and thousands of years, has been preparing these miniature cats, weasels, crocodiles and snakes just to scare off the inquisitive Entomologist like myself?

A. L. H. Townsend (1691).

AN EASY WAY OF COLLECTING THE BEAUTIFUL YELLOW UNDER-WING

Whilst out walking on an East Sussex heath, I was surprised and interested to observe *Anarta myrtilli* feeding off the flowers of rhododendron.

At the north end of the heath there is a long line of rhododendron bushes, spaced at varying intervals. Seeing one yellow underwing flying around these, apparently about to alight, I waited until it settled on one of the flowers. Upon closer inspection, I found that two more were sitting right inside the long tubular corollas, feeding from the nectaries. These moths were very easily taken. Thus encouraged, I passed down the line of bushes, and found specimens on most plants. On one, a rather isolated bush, I counted no less than fifteen actually feeding, and a further dozen flying near as though about to alight.

Within the petals of some of the flowers, I found the spider *Misumena calycina*. This handsome spider lies in wait to catch and kill unwary insects as they come to feed. I found several dead yellow under-wings, and watched the capture and death of another. This spider is able to change its colour to accord with that of its background. In this case, it was a pastel shade of green with a suggestion of the pink of the rhododendron.

During the short period of my attention to these flowers, I caught a remarkably good series of the moth. I can think of no better way, in the vicinity of rhododendrons, of collecting them, and the ease with which they may be boxed while feeding on this plant is sufficient recommendation for the method.

W. J. Higgins (2072*).

LUSUS NATURAE

Although variations and aberrations in the colouring, size and shape of insects are frequently met with, and specimens with stunted or malformed limbs are not uncommon, it is surely most unusual to find an insect with perfectly formed *additional* limbs.

I have recently acquired a specimen of *Sirex gigas*, the Giant, or Pine Sawfly, which has an extra leg, slightly smaller than a fore-leg, attached directly behind the hind-leg on one side. Although upon examination I could find no trace of a corresponding limb having been situated behind the other hind-leg, I imagine that originally there was in fact a leg there also, so that the insect before being presented to me by its captors, (who had mistaken it for a hornet) may have had eight legs.

Since I have never heard of a similar occurrence, I thought it might be of

interest to report it. It may prompt others with similar freaks or unusual insects to record the fact.

B. G. CHATFIELD (1704).

[*Members may like to refer to Dr. E. A. Cockayne's article on reduplicated limbs in* Cantharidae (Col.) *in* E.M.M. **79**: 200 (1943).—ED.].

AN ABERRANT MEADOW BROWN

In 1948 I was fortunate enough to capture two aberrant specimens of *Maniola jurtina* (the Meadow Brown butterfly) but omitted to report them, originally because I wanted first to make a more comprehensive survey of the locality in which I found them. I have, however, captured no further examples and indeed have spent eighteen months abroad.

It was on 17th July in that year that I was collecting Chalk Down butterflies on the North Downs near Maidstone, Kent. An unusual butterfly caught my eye as it flew low over the grass and I got my net to it. The insect was a Meadow Brown differing from the normal by having the ground colour mainly of clouded cream, with patches of the usual dusky brown. It had obviously been on the wing for some time and its left forewing was partially crippled.

♂

To my amazement, only a few minutes later, I saw yet another aberration of the same species, with half the left hindwing coloured creamish. This when captured proved to be in fairly good condition. The first specimen is not unlike *M. jurtina* ab. *radiata* pictured in F. W. Frohawk, "Varieties of British Butterflies". In the drawing of it the dark areas represent the normal background colour.

B. C. A. EARL (1388).

INSECT ORDERS

(*Continued from Vol. 10, page 124*)

Order XI

EPHEMEROPTERA (*Mayflies*)

Mayflies are small to medium sized insects with the hindwings reduced or absent and the wing venation primitive with numerous cross-veins. They are unique amongst insects, in moulting in the winged stage, for from the aquatic larva (or nymph) arises the duller sub-imago; this soon sheds its cuticle again and the imago itself emerges. The end of the abdomen has two cerci and sometimes a median projection. The antennae are very short in the adult. The aquatic larvae of most species are vegetable feeders, they live for up to three years, passing through many moults (twenty-four in *Cloëon dipterum*). Their shape is very variable, for they are adapted to many environments, from stagnant ponds to fast-flowing streams. Mellanby (1938) divided them into: (a) burrowers, (b) much flattened, living amongst strong currents, (c) swimmers, (d) creepers. The three caudal processes are always present, though often modified. Along the side of the abdomen are normally seven pairs of plate-like outgrowths, misnamed "gills," for their major function is not the absorption of oxygen, but probably to keep a current of water flowing over the body surface, where oxygen absorption does occur. These outgrowths are absent in the very young nymphs. The adult mayflies are short lived, from only a few hours in many of the night-flying species, up to a maximum of several days; they cannot take any food, the mouth parts being vestigial and the gut modified into a hydrostatic organ used in the aerial dances. The males form large swarms that dance by flying upwards rapidly and gradually falling, the females fly through these and are caught by the males, with their long forelegs from below. The eyes of the male have larger facets in the upper portion than the lower, in some these are raised on a projection forming a turbinate eye; it has been said that species with this type of eye dance vertically, while those with the more normal eyes dance at about 45°, but this is much affected by wind.

The eggs, which vary greatly in structure and number (from a few hundred to several thousand) according to species, are laid either in batches on the surface, gradually

separating and sinking, or below the surface, especially on the underside of stones (this method is only recorded in some *Baëtis* species). The eggs usually hatch in a few weeks, but *Cloëon dipterum* is often viviparous.

Mayflies are well known to anglers, who refer to the sub-imago as a "Dun" and the imago as a "Spinner," while many of their "flies" are made up to resemble certain species. Much information on Mayflies together with simple keys and descriptions will be found in *An Angler's Entomology* by J. R. Harris (Collins, New Naturalist Library, No. 23), which is well illustrated with colour plates.

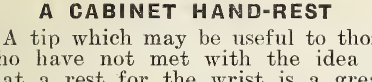
There are about 3000 species known, the majority from the tropics; the 47 species occurring in the British Isles may be identified from D. E. Kimmins' key in *Handbooks for the identification of British Insects*, Vol. 1, part 9 (Royal Entomological Society), which also gives keys to the nymphs, or the same author's *Keys to the British Species of Ephemeroptera with Keys to the Genera of the Nymphs* (Freshwater Biological Association). The order is divided into several families, the exact number being a subject of dispute between authorities.

(*To be continued*)

BRIAN O. C. GARDINER (225).

A CABINET HAND-REST

A tip which may be useful to those who have not met with the idea is that a rest for the wrist is a great help when arranging insects in drawers. A flat piece of wood not more than 2″ wide and ½″ thick is chosen and sawn off to a length somewhat greater than the width of one's drawer. A narrow section of the same wood is screwed or glued beneath



at each end, so that there is no danger of the support's slipping or falling into the drawer when in use. The idea is seen in the accompanying diagram, compressed to save *Bulletin* space. The wrist is supported while the pins of the specimens are being pressed home and there is much less risk of weary, incautious movements. Moreover, it can assist neat alignment.

G. C. HOLROYD (253).

ANNUAL EXHIBITION, 1953

It was with a pleasurable sense of anticipation that I made my way to the 9th Post-War Annual Exhibition. Quite apart from the attractive exhibits and lectures, the occasion is always a grand opportunity to contact other members, to talk 'shop' and exchange views and to meet old friends once again. That many others shared this view was borne out by the constant stream of enthusiastic members and friends who ensured that the 1953 Show was once again an outstanding success.

Looking around, it was pleasing to see that, though Lepidoptera was the largest single Order represented, the other Orders were by no means neglected. Prominent among the exhibitors were two of the AES Special Groups. The Silk Moth Study Group had a fine display of bred moths, living larvae, photographs and coloured transparencies and members answered a continual stream of queries. A tribute to the fertility of the Silk Moths was shewn by the many hundreds of surplus larvae of *Antheraea pernyi* and *Philosamia cynthia* distributed at the Exhibition for study purposes. Needless to say, this was much appreciated by many junior and senior members present. The Microscopy Group made available a large Binocular Microscope with interesting slides, a copy of the most informative 3-monthly Bulletin which circulates between members of the Group and also an example of the apparatus designed for drawing insects by reflected image as described on pp.54-55.

To mention a few of the exhibits, we were very pleased to welcome Mr. L. C. Bushby (1075), Curator of the Insect House at the London Zoo, who brought along living specimens of exotic grasshoppers, Stick insects, scorpions and Leaf insects; Mr. W. W. Roberts (77) evoked great interest by showing a lively specimen of the large British Raft Spider from Studland; Mr. E. Lewis (952) showed water beetles; Mr. W. E. Russell (1525) a case of mixed Hymenoptera, one of Symphyta and an old collection of Coleoptera from the Peterborough district; Mr. B. L. J. Byerley (788) Diptera, *Syrphidae* and a rare species of *Buprestidae*, *Agrilus pannonicus* Piller & M.; Mr. C. M. Idle (2118*) a long series shewing the variation in *Adalia bipunctata*; Mr. D. Cardy (2256*) Coleoptera. Mr. K. C. Side (2140) displayed ten large sheets of detailed drawings of

beetles, and Mr. J. F. M. Floyd (2018) two impressions of giant silk moths in oils.

There was a fine display of Lepidoptera, but it was disappointing to see that the Micros were poorly represented. The appearance, last year, of a popular reference book on the Pyralid and Plume Moths should have encouraged a livelier interest in this section. Living exhibits are always attractive and a fine variety of larvae were shewn by Messrs. F. S. Smith (1849), S. M. Hanson (320), J. B. M. Stewart (2150) and D. Ollevant (1514). Mr Hanson also provided cases of set lepidoptera from various localities; Dr. G. H. Bull (160), Prominents; Mr. R. J. Woodward (2247), a collection from Surrey; Mr. L. W. Siggs (243) the very impressive number of species taken in a mercury vapour trap in Kent; Mr. S. E. Holland a collection shewing five additions to the Eastbourne list and including the very rare *Calophasia lunula* Hufn. (Toadflax Brocade); T. J. Rutty (2114*) some nice aberrations; and Mr. P. C. Le Masurier (978) a case attractively laid out to illustrate a Field Meeting held at Fenns Moss in the successful quest of *Coenonympha tullia* (Large Heath).

This year's special exhibit was again organised by Mr. Byerley. It consisted of a comprehensive array of collectors' apparatus ranging from a large meat-hook planted on the end of a pole (for pulling down branches of trees for inspection) to the latest mercury vapour Moth Trap. Mr. S. C. Hartley (1939) demonstrated an effective but simple machine of his own making for printing data labels.

Four overseas members had sent exhibits, namely Mr. A. L. Capener (6) from South Africa, Dr. A. H. Newton (1140) from Natal, Mr. A. L. Townsend (1691) from Kenya, and Miss N. O. Ika (1423) from Nigeria (East).

Our guest lecturer was Dr. Maurice Burton, who gave a thought-provoking talk on "The Mind of an Insect". Mr. E. E. Syms (406) spoke on "Our Social Insects", and Mr. W. J. B. Crotch (1181) talked about "Rearing Silk Moths". Mr. J. G. Green (1795) demonstrated the art of setting Coleoptera, and Mr. Hanson that of setting Lepidoptera. The method used by the latter was to pin the insects backwards on the setting board and then draw the wings towards himself. He claimed that this way was less likely to damage the wings than the more conventional method.

As in past years, leading Natural History Dealers were in attendance and added much to the general interest by their displays.

Ten of our visitors decided to become members of the AES.

R. D. Hilliard (99).

NOTES ON 1953

A great attraction of the AES annual exhibition is the chance of meeting other members to discuss collecting experiences of the season.

Quite a number of people I met during the show mentioned the scarcity of butterflies in 1953. Whilst I was rather inclined to agree from a general point of view, there had been a number of species which in my experience were well up to expectation in their local haunts. On May 17th, a trip for larvae of the White Letter Hairstreak (*Strymon W-album*) in Surrey proved that this species was very common in the larval stage and many were fully fed and ready to pupate. The last day in May was too late for the Black Hairstreak (*Strymon pruni*) larvae in Bucks, and only two pupae of this insect were beaten. However, during this operation, the larvae of the Brown Hairstreak (*Thecla betulae*) fell into the beating tray without much trouble and were obviously plentiful. A similar encounter with larvae of the Purple Hairstreak (*Thecla quercus*), whilst beating the oaks, rather indicated that this species was well established. During the latter part of June the imagines of *pruni* were observed and, judging from the numbers, 1953 must have been a good year for this insect in that locality.

The White Admiral (*Limenitis camilla*) flew in woods around Ruislip, Middlesex, in normal numbers during early July. My trip to Westmorland in August (see p. 73) showed that the Scotch Argus (*Erebia aethiops*) was quite common in its local haunts; though I was unable to compare with other years, this being my first experience of this species. During September there were large numbers of Small Tortoiseshell (*Aglais urticae*) in the home counties and I understand that many fine varieties had been encountered, though all the specimens that I saw were true to type. However the finding of a nest of larvae in the second week of September is so unusual that it is worth a mention.

Of course, comprehensive observations can only be made by a number of entomologists and not by one individual. These notes I have made

should be used in conjunction with other reports to gain a more accurate account of the season. So let us hope to read of other AES members' experiences in the pages of the *Bulletin*.

S. M. HANSON (320).

Mr. ALAN P. MAJOR (1117) reports several increases and decreases in butterfly numbers in North Kent.

The Marbled White did not appear at all in two of its old localities, but he found it in a new one two miles away. Peacock, Red Admiral and Painted Lady were in usual numbers, and the Small Tortoiseshell was very common. He did not see any Commas flying, but had one larva brought to him. Others up to usual numbers were the Whites, Blues, Brown Argus, Orange-tip, Small Heath and Wall, the Brimstone being more common than usual in several new localities. The Gatekeeper had also increased in a new habitat; but the Meadow Brown was less common and the Grayling did not appear commonly in any of its usual haunts on the North Downs, probably for lack of hot days.

He nowhere found any of the usually fairly common Fritillaries, Small and Pearl-bordered and Dark Green; neither did he see the Pale Clouded Yellow, or Clouded Yellow, though one or two are usually noted.

●

OBSERVATIONS

Mr. S. DEXTER (847) reports that caterpillars of *Callimorpha jacobaeae* (the Cinnabar moth) have stripped his garden peas of all foliage, although their normal food, the Ragwort, is plentiful around him near Padstow. Is this a new food-plant for the species? It could easily become a pest.

Mr. G. GOODBODY (1470) writes that August Bank Holiday seems to be a lucky day for him. A few years ago he caught a continental Swallowtail Butterfly on that day; and this year in his Brighton garden he took *Cupido minimus* (the Small Blue butterfly). It was a female. Blues have not been common in his immediate district and he saw none at all in May or June. As second broods of the Small Blue are unusual, he wonders if it was an immigrant blown across the Channel.

Mr. W. G. C. BOOKER (1742) reports that when he was spraying a nest of ants (*Acanthomyops niger*) he noticed two very small black flies attacking the workers, in every case between the fourth and fifth abdominal segments. The ant attacked stopped and reared its head in the air and then went on as usual. Donisthorpe thought this type of fly (*Pseudacteon formicarum* Verrall, PHORIDAE) was attracted by the smell of the formic acid. (See Donisthorpe, 1927, "Guests of British Ants", pp. 131-2.) Mr. Booker was spraying with a liquid which had a very strong smell like sour soapsuds and he wonders that this did not mask any natural odour.

Mr. R. H. BENSON (1444) writes:—"Having taken indoors (9/9/53) what I presumed to be the imago of the May Highflyer (*Hydriomena impluviata*), I consulted my books as to the habits of this species. Understanding that the larvae made their home in a rolled leaf of the Alder, I proceeded to confuse this tree with the Elder (and am probably not the first to have done so). Upon inspection of a blackened rolled leaf on the latter tree, I found about a dozen larvae of the Tiger Moth (*Arctia caja*). The majority quickly fell to the ground, but I kept four. Within a few hours of being placed in a cage with a plentiful supply of elder leaves, all four congregated together on the same leaf. I have already commented upon the larvae of this species feeding when young on the leaves of high trees, although their ultimate habitat is on the ground (p. 61). I have not seen this fact, which appears to me to be contrary to usual habits of larvae generally, commented upon in any of the standard books, neither have I noticed mention of the gregariousness of the Tiger larvae when young. South states that the larva is not often seen before hibernation.

By 12/10/53 the four larvae, after eating sparingly, took up winter quarters in a rolled leaf, which has become dead and blackened. Presumably when the leaves fall to the ground this affords the larvae a method of reaching their ultimate foodplants on the ground."

Mr. G. H. W. CRUTTWELL reports that on 26th September whilst on the Wiltshire Downs, he took a rather worn female *Lycaena boeticus*. The tails had practically disappeared and the purple scales had lost their lustrous colour. He netted this by pure chance, for it looked like a worn *L. icarus*: but the moment it was in the net the underside was very obvious.

Mr. S. M. HANSON (320) answers Mr. A. P. Major's query on p. 61, by suggesting that the larva which he saw

on the Lady orchid (*Orchis purpurea*) was that of *Argyroploce rivulana* Scop. This is a species of *Microlepidoptera* which feeds on both leaves and flowers of the Orchis group during the months of May and June, the perfect insect appearing in July.

Mr. A. L. B·IDGEN (2090) writes:—"The other day I was shown a rather unusual exhibit. This was a box containing portions of cheese. Through the bottom of the box a species of Hymenoptera had bored a hole, which was continued through the foil covering. The fly was half buried in the cheese and was dead.

The identity of the fly could not be ascertained without removal, as barely half the length of the wing could be seen and my friend wanted to keep the lot intact. Can any member throw any light on this occurrence? Are there any hymenoptera with a distinct liking for cheese or was it trying to find a suitable place for ovipositing?

BRITISH SOCIAL WASPS

Mr. H. K. AIRY SHAW writes:—"*A propos* of last month's article, the late T. Bainbrigge Fletcher gave me the following very useful key to the workers of the British species of *Vespula*. I cannot say whether it was original.

1. Eye not nearly touching base of mandible; antennal scape marked anteriorly with yellow. .... 2.
— Eye touching or nearly touching base of mandible; antennal scape wholly black. .... 3.
2. Clypeus with a small black central spot; abdomen without red markings: .... *sylvestris*.
— Clypeus with a broad black central line; abdomen generally more or less red at base: .... *norvegica*.
3. Abdominal hairs black: ... *rufa*.
— Abdominal hairs not black. ... 4.
4. Clypeus with only three black spots; yellow of the lateral line on pronotum more or less produced on outer margin: .... *germanica*.
— Clypeus with a central black line; yellow lateral line on pronotum parallel-sided: .... *vulgaris*.

N.B. *V. austriaca* has no worker caste: in its male and female the eye touches the base of the mandible, but the antennal scape is yellow in front, and the abdomen has thick black hairs.—T.B.F."

A NEW ZEALAND STICK INSECT IN SOUTH DEVON

Hope springs eternal in the breast of every entomologist; but I think I must have been feeling particularly optimistic when I set myself the task of re-discovering a New Zealand Stick Insect locality in this country. The Editor of "Country Life" has given me permission to quote for fellow AES members from an article I wrote for that Journal.

My curiosity was first aroused in this matter by a report published in the "Zoologist" 1910 that a female 'spiny' stick insect had been taken out of doors in 1908 by a Mrs. M. F. Arbuthnot of Paignton. Kirby identified this insect as belonging to a species described from New Zealand. He did not apparently give any suggestion as to how it came to be there and subsequent naturalists have not pursued the matter. I felt certain that the Paignton stick insect had been regarded (by the few who may have given thought to the matter) as a practical joke by some unknown entomologist. I set myself the task of confirming that the progeny of that first stick insect had maintained themselves in Paignton continuously since 1908, in order to support the claim of the Prickly Stick Insect, *Acanthoxyla prasinus* as an addition to the British List.

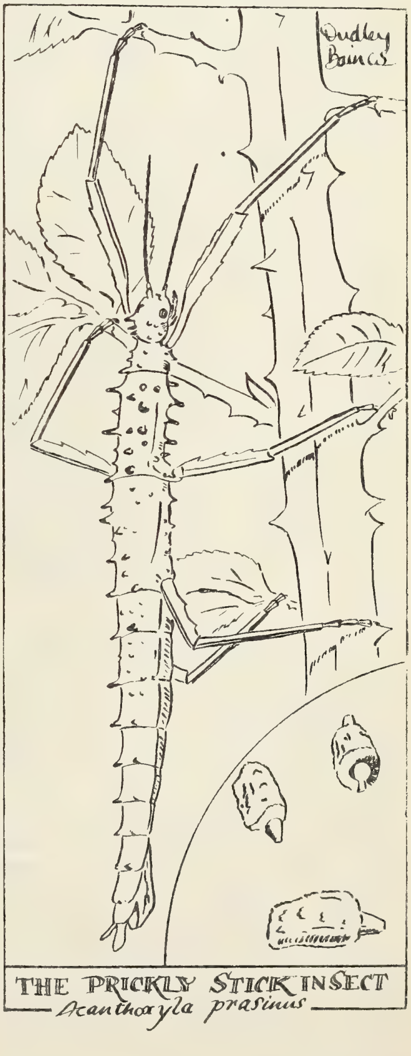
The month of August, I thought, afforded me my best chance of success, since any insects that might still be in the area would have had plenty of time to become better established during the summer months. My arrival in Paignton, however, coincided with a patch of weather totally unsuitable for out-door work. It was a few days after the Lynmouth disaster and the Press reported it to be the coldest August day for ten years; despite my enthusiasm for the cause, I expected to return empty-handed.

Modern Paignton was useless for my purpose, as most of it had been built since the capture of the original mystery insect, and I therefore concentrated my attention on the Old Town. A school with a tarmacadam playground, a maze of roads, terraced houses with tiny gardens and nothing more inspiring than a few godetias and geraniums; how could my stick insects have survived in such surroundings? My steps led me instinctively away from all this, and I found myself approaching three or four fine houses of what I judged to be

the correct vintage. I was struck by a curious tree which dominated the first of these gardens and I decided at once that I must start my investigation there.

When the door was opened to me I explained my mission and told my story, as far as I could. The householder was a very obliging man and did his best to help me. He said that there was certainly no Mrs Arbuthnot living near there, nor to his knowledge, had there ever been; stick insects, however, meant more to him. He took me to a cypress tree in the shadow of the curious tree which had first caught my eye, and parted the branches; there was my quarry, and the hunt was up. Far from protecting these stick insects, my host assured me that the whole family disliked them and generally killed them on sight. Despite this, he said, the insects had persisted during the fourteen years of his occupation. At dusk I returned to the garden and made a thorough search of all the trees and plants with the aid of a powerful lamp; the evening's work resulted in the capture of fifteen adult females and two young insects. All the adults were about 5″ long, but varied in the extent of their spininess and in colour. My first capture, and five of the others, were green, and agreed with Kirby's description of the species; but the greater number were rather different. Two of them were a very dark brown with chalky blotches along their backs, and their spines were almost non-existent. The remaining eight were a somewhat paler brown, but these also were less "spiny" than the green type. The capture of females only seems to indicate that the male is very rare or unknown and that the species reproduces itself parthenogenetically. The two nymphs were brilliant green, and I judged them to be only a month or two old. Foodplants acceptable to this species were the cypress, myrtle, rose and bramble, but their existence at Paignton seemed to be mainly associated with the tree which had attracted me to that garden. Mr. H. K. Airy Shaw (545) kindly identified it as the Japanese Cedar, *Cryptomeria japonica* var. *elegans*. In the severe winter of 1949, dozens of stick insects were found dead beneath this tree, but the dense foliage seems to have provided sufficient protection for the eggs to enable the colony to build up again. The next day I found another *Cryptomeria* of about the same age as the first, and learned from the owner of this tree that stick insects existed there also. The owner of the second *Cryptomeria* had known Mrs. Arbuthnot, who, in 1908, was living opposite the house where I had made my first chance call! I had turned the pages of natural history back 44 years.

The final question which presented itself might never be solved. How did the Prickly Stick Insect come to arrive in Paignton in sufficient numbers



Adult female, with inset views of egg capsules. The nymph emerges from the capped end of the capsule.

to be able to establish a colony? There seem to be two possible answers —either the eggs could have been imported around the soil at the roots of New Zealand Plants, or someone collected eggs at the foot of a tree in New Zealand, thinking them to be the seeds of the tree, brought them to England and threw them away on discovering his mistake. A discovery reported in 1943 supports the first theory. Major Dorrien Smith reported the capture of a Prickly Stick Insect at Tresco Abbey in the Scilly Isles, and, on being told of its New Zealand origin, remembered having imported a large number of New Zealand plants in the years 1907 and 1909. Some of the plants had been sent to the mainland in 1907 and distributed in several places there, including Paignton. Are there then other undiscovered colonies in England dating back to 1907? In solving one problem in Nature, you can always find another; but I regard myself as fortunate that I was able to return home with so many blanks of my story filled in.

There seems no reason to doubt now that this New Zealand Stick Insect has been living continuously in Paignton for at least 44 years. That it has done this, and built up a strong colony there, despite many adversities during that time, proves how well this mystery visitor has become adapted to its new country. My investigations have left me in no doubt that the Prickly Stick Insect (*Acanthoxyla prasinus*) has every right to be regarded as a naturalised British insect.

For those interested in the prospect of keeping Prickly Stick Insects in captivity, some observations on my own attempts to keep a stock going at my home in Kent may prove useful. I was interested to note that, whilst the Torquay Corporation have had great difficulty in combating a plague of Common Stick Insects, *Carausius morosus*, in their greenhouses, no Prickly Stick Insect has yet been found under cover. There are similarly no records of *Carausius morosus* in the open. This may be significant and I certainly found it necessary to adopt quite different methods with the two species in captivity. Several of my *prasinus* died within the week when confined in a type of cage suitable for lepidopterous larvae; and healthy conditions were maintained only when the insects were placed out of doors in muslin sleeves on bramble, rose or cypress. I made sure that the sleeves were placed in a shady spot of the garden. Eggs were dropped freely during warm weather, but their production practically ceased during late Autumn. The early frosts seemed to affect the adults more than the nymphs, but all my stock died by mid-December. My observations with the hatching of the eggs of *A. prasinus* will give some indication as to the length of time which these can take to develop:—

Eggs laid Aug.-Sept. 1950 hatched Aug. 1951—nymphs refused to eat.
Eggs laid Sept. 1950-March 1951 hatched May-July 1952—nymphs survived.

The newly hatched nymphs responded well to a light spraying of water and those emerging from May, 1952, onwards grew steadily on cypress out of doors. There was a high percentage of deaths during the first week after emergence, but after the first instar there was no more trouble. My own experiments at this stage were brought to an abrupt end by a domestic mishap; but I am certain that I have gained sufficient knowledge to enable me to rear the species successfully when the opportunity next presents itself. I do not regard this species as an easy breeder, however, and it is unlikely that it will oust the Common Stick Insect, *Carausius morosus*, from its place as the student's pet.

My thanks are due to Mr. Dudley Baines for the accompanying drawing, which he prepared from a photograph and set specimen of the species.

C. F. RIVERS (1443).

LARVAL LONGEVITY

Between 16th March and 5th April 1953, a batch of *Eacles magnifica* Walker (*Ceratocampinae*) from South America emerged from the egg. Most of them pupated within two weeks of 25th May, but one larva which was smaller and slower than the rest, continued to feed regularly and pupated on 2nd September. All were fed on Privet and kept in the same cage in a cool room. It would be interesting to hear of any other records of larvae feeding for five months without diapause.

L. W. SIGGS (243).

"OTHER ORDERS" AT LIGHT

I would like to know the experience of members as to insects of "other orders" being attracted to light. I mean regularly attracted, not merely occasionally; and I mean

to ordinary house-lights, not to mercury vapour. My own, very limited, experience would suggest that, at any rate in the Coleoptera and Heteroptera, to which alone I have given any attention, such "regular" visitors are remarkably few. It is obvious, of course, that very much depends upon the locality and situation of the house. My own observations amount to no more than the following:—

COLEOPTERA
Cotswolds (Glos.)
Aphodius rufipes L.
Lampyris noctiluca (L.)

London Area
Tenebrio molitor L.

HETEROPTERA
Cotswolds (Glos.)
Reduvius personatus (L.)

London Area
Blepharidopterus angulatus (Fall.)

Of these, the *Aphodius* came extremely commonly, but I have never known any other member of the genus come to light. Its flight is strong and boisterous. In contrast, the male glow-worms float slowly in through the window, like strange little black ghosts. The meal-worm beetle usually "crash-lands" almost at once, on floor or furniture. The slender little green Mirid bug *Blepharidopterus* (a tree feeder) flies surprisingly strongly, and will gyrate around the light for a considerable time.

Will other AES members report their experiences, of these or other orders?

H. K. AIRY SHAW (545).

THE LARGE HEATH IN SHROPSHIRE

I agree with Mr. P. C. Le Masurier (p. 74) that the dates given for the Large Heath (*Coenonympha tullia*) do not apply to the ab. *philoxenus* found on the Shropshire Mosses. This summer I visited Whixall Moss on July 4, 5 and 8: on the last date I was blown off the Moss by a gale after taking one insect. On July 4 there was a north-east wind and only intermittent sun; July 5 was fairly sunny but there was a very strong westerly wind. On each day I took in about an hour and a half seven or eight specimens, mostly disturbed from the heather. The females were in adequate condition but the males very worn. According to Frohawk this is the best week of the year for taking the butterfly; but it is clear that in Shropshire one should be a good fortnight earlier. In Inverness-shire, in 1950, I found the ab. *scotica* (both sexes) in quite good condition between July 10 and 20. This was at Dalwhinnie, on high and exposed ground.

F. H. LYON (1026).

REVIEWS

Entomological Photography in Practice. By E. F. Linssen, F.Z.S., F.R.E.S., F.R.P.S. Pp. 112 with index; 55 illustrations. The Fountain Press, London, 1953. Price 32/-.

An entomologist who observes and records the activities of insect life must often wish to produce lucid and indisputable data of his findings. Resorting to verbal descriptions alone, he may find difficulty in re-creating his impressions and also in avoiding the liability of misinterpretation. As an aid, he must often wish to illustrate graphically or photographically. It is then that a book of the kind written by Mr. Linssen can become a valuable asset. It is designed to explain to the reader who has little previous knowledge of photography how best to record insect natural history with the camera.

The author leads the reader step by step through the early stages of selection of apparatus, merits of lenses, filters, films etc., to chapters on 35 mm. technique, electronic flash, macroscopes and microscopic work. All this information has been treated in a straightforward manner and, although never very technical, it leads the reader accurately in the right direction. However, taking into consideration the cost of the book, I feel that in some cases more specific details would not have been amiss: for example, makes of films with a guide to their development in respect of the special quality desirable; or again, full information on different lighting conditions, including the full use of artificial types. A chapter on colour would have been helpful, as 35 mm. work is now very popular with the amateur and the projected transparency can be invaluable for studying insect colouration.

Mr. Linssen has been careful throughout to blend the two subjects in such a way that photography is approached as the servant of entomology. He insists that for scientific records no interference with the

natural element of the insect should be tolerated and he has given many subtle instances on how best to photograph the different insects, including moths, butterflies, beetles, galls, pond dwellers, parasites and an interesting chapter on the " awesome spider."

The 48 photographic reproductions are well selected, each demonstrating a special slant. The diagrams include suggestions for rearing cages and a useful drawing of a photographic bench.

Generally I feel that anyone new to the camera and wishing to explore the insect world photographically would benefit by reading this very pleasant, but rather expensive, little book.

C. H.

Handbooks for the Identification of British Insects. Published by the Royal Entomological Society of London. 25th August, 1953.

Vol. IV. Part 3. *Coleoptera: Hydradephaga.* By F. Balfour-Browne. pp. 33. 44 text figs. Price 6/-.

As the author explains in his introductory paragraphs, this book is in the nature of an abstract of his two-volume work, *British Water Beetles*, published by the Ray Society, containing the keys, with some improvements made to them. It may justly be described as indispensable to those coleopterists who are without the larger work, and convenient to those who are fortunate enough to possess it.

Extensive use is made of underside characters, not all of which will be immediately evident to the beginner with a pocket lens, but the keys are thoroughly sound, and perseverance will bring the enquirer to his goal. There are few misprints, but it should be noted that on p. 12, line 5. " tetramerous," repeating the character already given for *Hygrotus*, should presumably be " pseudotetramerous."

Vol. V. Part 7. *Coleoptera: Coccinellidae and Sphindidae.* By R. D. Pope. pp. 12. 23 text figs. Price 2/6.

A title indicating a work on Ladybirds leads one to expect page upon page of figures of elytral patterns. But no; here the author gives but one, illustrating a hybrid, and includes four artistic drawings of whole insects by Mrs. C. A. O'Brien. The keys are based mainly on structural characters, some of them underside, and the conscientious purchaser of this part will industriously soak his specimens off their cards; others, less so, may be tempted to cheat with Joy's or some other figures. Either way, reliable identifications should be the result of using this little book. It includes a key to the two small, obscure, species of British Sphindidae, one of which (*Aspidiphorus orbiculatus* Gyllenhal) has more often been placed in a family of its own, the Aspidiphoridae.

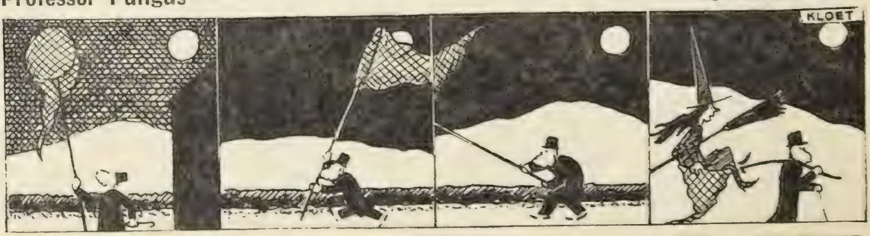
Vol. V. Part 15. *Coleoptera: Scolytidae and Platypodidae.* By E. A. J. Duffy. Pp. 20, 40 text figs. Price 3/6.

The keys to these two families include both native and imported species, with indication of the status of the latter. They are based on those of A. Balachowsky (Faune de France, **50**: Coléoptères Scolytides, 1949), a rather expensive work, and Mr. Duffy's keys may be regarded as a more economical, more comprehensible and, for this country, more comprehensive survey. Upperside characters are used. The usual host plants are given for each species, most of which are, of course, wood-feeders; but mothers and wives of purchasers may expect invasions of the kitchen in pursuit of more untypical importations, such as *Stephanoderes coffeae* in the coffee, or *Cryphalus buscki* among the nutmegs.

All three parts have the concise authority which distinguishes this series.

E. L.

Professor Fungus **By G. S. Kloet**



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